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The Gordon Bell Memorial Lecture

Some Aspects of Preventive Medicine
J. G. FITZGERALD

Bovine Infectious Abortion and Its Relationship to Public Health
CHARLES A. MITCHELL

Undulant Fever in Ontario
A. L. McKAY and A. L. McNABB

Some Terms Used in Public Health
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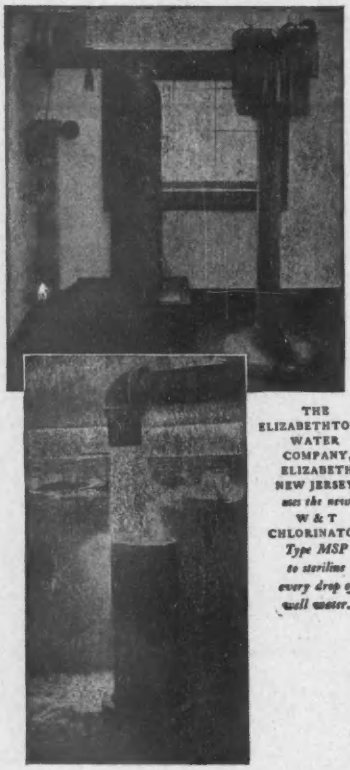

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Gordon Bell Memorial Lecture*

Some Aspects of Preventive Medicine

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MAY I at once express my deep appreciation of the high honour conferred upon me by the Winnipeg Medical Society in inviting me to deliver the Gordon Bell Memorial Lecture for 1928. I had the rare good fortune to know somewhat intimately the dear good man in whose memory this lecture was established. For a number of years I was his colleague on the Dominion Council of Health. Much more, however, I treasure our many, and for me, inspiring discussions of a wide range of subjects upon which Gordon Bell could speak with real authority. Never did he dogmatize nor become pedantic. Modesty, true culture, breadth of learning and a delightful sense of humour were his chief characteristics. He was a frequent and ever welcome guest in our laboratories, and his passing was a source of profound and abiding regret to my associates and to me. To very few is given the priceless gift possessed in such large measure by Gordon Bell of inspiring deep and lasting affection and respect. May his courage and splendid idealism be a continuing inspiration to the members of the medical profession throughout the length and breadth of this great Dominion. It has been suggested that upon this occasion I might choose as my text "Some Aspects of Preventive Medicine". I do so gladly.

Preventive medicine, in the sense in which it will be used in this address, is the application of any or all the methods of medical science which will prolong life, promote health or prevent the occurrence of sickness. The methods of preventive medicine may be specific or general. Specific preventive medicine or immunology embraces the field of vaccination and passive immunization. General preventive medicine includes all those procedures which, in the practice of obstetrics, pædiatrics, medicine, surgery or the specialities, preserve or promote health. These may be distinguished from therapeutic measures

*Presented at a meeting of the Winnipeg Medical Society, November 30th, 1928.

aimed at the cure of disease. Periodic health examinations, antenatal care, the practice of infant and child hygiene, advice in respect of diet, exercise, rest, clothing, etc., for healthy individuals, illustrate some of the procedures of general preventive medicine.

Sanitary science or sanitation includes all efforts directed towards the elimination of health hazards in the environment and the creation of favourable conditions therein. Such procedures as water purification, sewage disposal, supervision and control of food-stuffs, community cleanliness, individual and collective, serve as illustrations.

Public health activities include all those procedures carried out by a public health authority in an organized health unit, federal, provincial or local, such as public health bookkeeping (vital statistics); health education; public health nursing; conduct of isolation hospitals; organization and supervision of health clinics (usually in conjunction with the organized medical profession) in hospitals or elsewhere; school health service; control of water supplies and sewage disposal; the conservation of food-stuffs; administration of public health laws and regulations dealing with notification, isolation, quarantine, disinfection, etc., in cases of communicable diseases.

None of the above terms is mutually exclusive. All may be used to connote varied aspects of one undertaking under certain circumstances. Similarly, exact and precise boundaries do not separate preventive and curative medicine.

In the evolution of preventive medicine the scope of the subject has been constantly extended. The practice of this branch is carried on by medical practitioners in the routine of general medical work or by those employed in departments of public health; also by private practitioners who undertake certain tasks (*e.g.*, school health service), upon a part-time basis for local or central health authorities.

As a part of the work of the health departments, measures designed to ameliorate unfavourable social conditions may be organized, supervised, co-ordinated or actually carried out by such departments. Similarly, community undertakings for the promotion of social welfare frequently are closely integrated with the work of the public health authority.

In this paper those aspects of the subject of preventive medicine in which the general practitioner has an important place will receive special consideration.

In the book of Ecclesiasticus the prime objective of preventive medicine, *mens sana in corpore sano*, is evaluated in these words: "There is no riches better than health of body; and there is no gladness above the joy of the heart." Let us then examine at the outset the ways in which preventive medicine has in the past contributed to these ends. History records that earlier civilizations had little, if any, protection from plagues and pestilences that stalked in the noon-day. Down through the ages and indeed until the fifteenth century Greek knowledge held full sway. While the birth of preventive medicine is usually said to date back to the time of Hippocrates, who stressed the healing

powers of nature, actually until the Renaissance there was no substantial increase in knowledge of the subject. During the fifteenth century Leonardo da Vinci and, in the sixteenth, Vesalius began to prepare the foundations of that substantial body of knowledge which to-day is described as scientific medicine. Three hundred years ago William Harvey introduced the experimental method into the study of physiology. Among his contemporaries were Willis and Malpighi, pioneers in scientific medicine, and Sydenham, one of the great figures of his time. These were also the days of Galileo and Descartes, the natural philosophers. The next century, the eighteenth, will perhaps in the future come to be looked upon as the real time at which Preventive Medicine was born, and certainly the work of Edward Jenner marks the beginning of specific preventive medicine, the science of immunology. Bacteriology, the companion subject of immunology, had its genesis at an earlier date. Fracastorius and Fallopius, in the sixteenth, and Kircher in the seventeenth, had preached the doctrine of infection being due to the seeds of disease. However, it was not until the middle of the nineteenth century that any scientific proof of the germ origin of disease was obtained. Davaine in 1850 observed that a specific micro-organism was present in the blood of animals dying of anthrax, and in 1876 Robert Koch established the specific etiological relationship to anthrax of these minute bacilli seen by Davaine. Pasteur in the early sixties of the last century began to make those fundamental contributions which have immortalized his name. These, with the contributions of Koch, may be regarded as the bases upon which the science of bacteriology rests. Some of the giants in bacteriology and immunology who followed Pasteur and Koch in the latter part of the last century were: Roux, Loeffler, von Behring, Kitasato, Yersin, Laveran, Ehrlich, Metchnikoff, Bordet, Robert Pfeiffer, and, of course, there were many others. Virchow was perhaps the first great pioneer in the sister science of cellular pathology. The contributions of these investigators have made possible the recognition and control of many of the scourges which in the past have devastated mankind.

Great fundamental contributions were being made during this period in the fields of natural philosophy and literature as well as in the medical sciences. This is illustrated in the following contemporary dates. These have been adapted from Sir George Newman's Essays, "Interpreters of Nature":

TABLE I

1543—"Fabrica" of Vesalius.
1616—Death of Shakespeare.
1628—William Harvey, "De Motu Cordis".
1637—Descartes "Methods".
1642—Sir Thomas Browne, "Religio Medici".
—Death of Galileo.
1659—Pepys's Diary.
1660—Foundation of the Royal Society of London.
1661—Malpighi, "Obser. Anat. de Pul".
1665—Great Plague, London.
1667—Milton, "Paradise Lost".
1687—Newton, "Principia".
1690—Locke, "Human Understanding".

TABLE II

1714—Inoculation introduced into England.
1718—Lady Mary Wortley Montague.
1720—Mead, "Discourse on Plague".
1722—Defoe, " Plague Journal".
1728—John Hunter born.
1736—Linnaeus, "Systema Naturae".
1752—Pringle, "Diseases of the Army".
1753—Lind, Scurvy.
1757—Lind, Naval Hygiene.
1761—Morgagni, "De Sedibus".
1770—John Hunter's School of Anatomy.
1772—Rutherford on nitrogen.
1774—Priestly and Lavoisier on oxygen.
1776—Adam Smith, "Wealth of Nations".
—Jeremy Bentham, "Fragment on Government".
1777—John Howard on prisons.
1781—Cavendish on hydrogen.
1782—Haygarth's fever wards.
1785—Withering on use of digitalis.
1792—Galvani on animal electricity.
1798—Jenner's "Enquiry".
1800—Bichat.

TABLE III

1800—Sir Humphrey Davy, nitrous oxide gas anaesthesia. (One of the Founders of Industrial Hygiene.)
1819—Laennec, inventor of stethoscope.
1826—Bretonneau, "Traité de la diphtérite".
1842—Pasteur, crystallography.
1843—Oliver Wendell Holmes.
—Semmelweis.
(Established the contagiousness of puerperal fever).
1846—Morton, ether anaesthesia.
1850—Davaine, anthrax.
1855—Lister.
1856—Pasteur, fermentation.
1859—Darwin, "Origin of Species".
1875—Public Health Act.
1882—Koch, Bacillus tuberculosis.
1885—Pasteur, anti-rabic vaccine.
1887—Metchnikoff, phagocytosis.
1888—Roux and Yersin, diphtheria toxin.
1890—von Behring and Kitasato, diphtheria antitoxin.

Early advances in sanitation were marked by the passage in 1388 in England of the first Sanitary Act which provided for the removal of nuisances. In 1543 an order was promulgated providing for the separation and segregation of persons suffering from plague. About two hundred years later Richard Mead recommended the introduction of quarantine, which had been applied after a fashion some centuries before in Italy. Following Mead, Heberden and Huxham investigated the infectious fevers and Haygarth introduced notification and isolation of these diseases (Newman). Pringle in the army and Lind in the navy advanced the cause of hygiene and sanitation. Successive epidemics of cholera in the first half of the nineteenth century in England greatly stimulated interest in sanitary reform. The name of Edwin Chadwick is associated with the pioneer efforts in the field of sanitary surveys (1842) which led to the Public Health Act of 1848. The work of Sir John Simon, the author of "English Sanitary Institutions", and of William Budd who, in 1873, demonstrated that typhoid fever is a communicable disease and elucidated the modes of transmission of the disease, deserve extended consideration. John Snow, at a somewhat earlier date, 1849, demonstrated that cholera is a water-borne disease. In 1854, in London during a cholera epidemic, he is reported to have told the vestrymen of St. James that the epidemic would subside if the handle of the Broad Street pump was removed. This was done and there were no further cases of cholera in that community. Budd is now regarded as one of the founders of the modern science of epidemiology. Experimental hygiene received its initial impetus when the first Hygienic Institute in the world was opened in Munich in 1875 under the direction of Max von Pettenkofer who contributed also to our knowledge of biochemistry and metabolism.

In the field of medical and vital statistics two very remarkable men, John Graunt (1662), in his famous "Bills of Mortality", and William Farr (1839-1880), in his collected studies in "Vital Statistics" (1885), outlined the principles and indicated the methods upon which modern public health bookkeeping is based. In two other branches of preventive medicine most substantial advances were made—these are tropical medicine and mental hygiene. In the former, Laveran, in 1880, by his discovery of the causative agent of malaria, and Sir Ronald Ross in 1897, in establishing the mode of transmission of the disease, made possible the elaboration of procedures for its control. In 1901 the Commission on Yellow Fever of the Medical Corps of the United States Army—Reed, Carroll, Lazear and Agramonte—by heroic and self-sacrificing experiments elucidated the fact that yellow fever is also an insect-borne disease. Other outstanding contributors in this field are: Sir Patrick Manson, who in 1879 first proved that insects serve as the vectors of parasites of human disease; Sir David Bruce, Leishman and Fritz Schaudin (who also discovered the spirochæte of syphilis). These are but a few of the contributors to medical science whose work has made life in the tropics possible for the white man.

Psychiatry and mental hygiene were first advanced by the great French alienists and humanitarians, Pinel (1801) and Reil (1803). John Connolly (1856), the Tukes and Griessinger were also powerful advocates of non-restraint and humane treatment of the mentally afflicted. With the rise of modern psychiatry in Germany and elsewhere during the past forty years there has been, notably in the United States and Canada, a rapidly growing interest in the problems of mental abnormality and subnormality. This has crystallized in the development of psychiatric clinics, provision for mental hygiene in schools, and the inauguration of auxiliary classes for the mentally subnormal. It should be recalled that the famous English humanitarians of the late eighteenth and early nineteenth centuries, such as: John Howard, who did so much for prison reform; Wilberforce, the abolitionist; Sir Humphrey Davy, pioneer in industrial hygiene; Richard Owen, whose efforts to improve the conditions existing among industrial and factory workers were so important; Bentham, the originator of the utilitarian philosophy, also an ardent supporter of the movement for sanitary reform and public health advancement; Lord Shaftesbury and Cobbett; these were all profoundly interested in the improvement of the health of the people. There is not time to consider how advances in the biological sciences and in the sister medical sciences have promoted the interests of public health and preventive medicine, nor can reference here be made to notable contributors in those fields.

Preventive medicine, or public health, of which the former is a part, is usually described as having passed through stages of which three at least are discernible. The first, beginning in Roman times in the provision of community water supplies, was aimed at the control of unfavourable environmental conditions. For three or four hundred

years in the British Isles, as well as elsewhere, interest was centred in this aspect of the subject. Specific preventive medicine was born about one hundred and thirty years ago. It had but little application before the rise of bacteriology.

In 1875 in England the first great public health act was passed and organized public health work began to move forward with greatly increased momentum. Soon the second stage of development was entered upon. The study of the etiology of communicable diseases, the sources of infection in these, their modes of transmission and methods of control both general and specific was vigorously prosecuted.

The third stage in the development of this movement has logically grown out of the second. Extended and careful study of the whole problem of mortality and morbidity and related social problems has clearly shown how broad is the field of public health.

Every factor which influences or may influence the health and well-being of the individual from the beginning until the end of life is of profound interest and concern to the public health authority and to the practitioner of preventive medicine. Until advances had been made in fundamental knowledge of biology, physics, chemistry, physiology, biochemistry, bacteriology, immunology, pharmacology and clinical medicine (including surgery and obstetrics) methods employed were often inadequate and results disappointing. Laws creating public health departments had not been passed and, in consequence, effective administrative procedures in public health were almost entirely lacking.

Medical education and the regulation of medical practice have advanced in a remarkable fashion, and this advance has had very beneficial effects. One has but to read the medical history of the past hundred years to realize why public health in general and preventive medicine in particular had not, until about fifty years ago, brought clearly into focus its real problems and in consequence had not developed methods for their solution.

The passage of the Public Health Act of 1875 in England inaugurated a new era in organized public health work. Much more rational and effective plans for the achievement of the broad purposes set out in the above enactment became possible. These purposes were:

(1) The supply of wholesome and sufficient water for drinking and washing.
(2) The prevention of the pollution of water.
(3) The provision of sewerage and utilization of sewage.
(4) The regulation of streets, highways and new buildings.
(5) The healthiness of dwellings.
(6) The removal of nuisances and refuse and the consumption of smoke.
(7) The inspection of food.
(8) The suppression of causes of diseases and regulations in case of epidemics.
(9) The provision for the burial of the dead without injury to the living.
(10) The regulation of markets, etc., public lighting of towns.
(11) The registration of death and sickness.

As Sir George Newman has said, "that programme represented the

most enlightened thought of the time (1871) regarding the sphere and scope of Preventive Medicine". This was the first stage already referred to.

TABLE IV

CANADA

1794—Quarantine Act passed—First public health legislation enacted in Canada.

1833—Act of Legislature of Upper Canada to provide for establishment of Boards of Health.

1882—Provincial Board of Health, Ontario, established.

1884—First "Public Health Act" in Canada passed (in Province of Ontario).

1890—Provincial Public Health diagnostic laboratory established in Provincial Board of Health of Ontario (first in North America).

1913—First rural municipal hospital opened in Province of Saskatchewan (Lloydminster).

1918—Department of Health, New Brunswick, created. (First Ministry of Health as separate department of government in the British Empire).

1919—Department of Health, Canada, established (now Department of Pensions and National Health).

1916—First full-time county health unit established in Province of Quebec.

TABLE V

ENGLAND

1834—Poor Law (relief) Medical Officers first appointed in England.

1847—Dr. W. H. Duncan, first English Medical Officer of Health, appointed.

1866—Local Boards of Health in England required to be established.

1890-1899—Acts requiring notification of cases of communicable diseases (England).

1907—Provision for supervision of health of school children applied throughout England and Wales.

1911—National Health Insurance—United Kingdom.

1919—Ministry of Health—England and Wales.

TABLE VI

UNITED STATES

1798—Marine Hospital Service (forerunner of United States Public Health Service) authorized by Congress.

1869—Massachusetts — first State Health Department in the United States.

1878—First Quarantine Act in United States.

1893—Marine Hospital Service in United States given federal public health responsibilities.

1902—Public Health and Marine Hospital Service.

1912—United States Public Health Service.

Soon advances in knowledge of the causation of transmissible diseases and the development of methods for their control made possible the transition to the second period in the evolution of public health. The necessity for notification of communicable diseases and the provision of isolation hospitals were especially emphasized in this era. Thus we arrive at the beginning of the present century. In the past twenty-five years maternal, infant and child hygiene have come to be a major feature of work in preventive medicine. School health services have been widely established and provision made for safeguarding the health of industrial workers. More intensive efforts have also been made to control certain communicable diseases, notably those of early childhood (diphtheria, scarlet fever, measles, etc.), as well as tuberculosis and the venereal diseases, gonorrhoea and syphilis. Substantial progress in the development of mental hygiene has resulted from a clearer appreciation of the great possibilities in this field. Preventive obstetrics, preventive pædiatrics and preventive dentistry have all made great strides during the past two decades. Nutrition and dietetics

have come to occupy an important place in the field of personal hygiene. These are some of the outstanding characteristics of the third stage in the evolution of preventive medicine.

This period has been characterized also by a remarkable extension of popular health education upon an unprecedented scale. This effort has received much impetus from the entry into the ranks of trained public health workers of the public health nurse. This addition to the personnel available for health educational work in the community has undoubtedly made possible more direct and effective efforts than had previously been put forth. The public health nurse, in the home, in the clinic, in the school, has brought to individuals and to groups the precepts of preventive medicine in its broadest aspects in a manner undreamed of a quarter of a century ago. Then, too, much more tangible and constructive social work in the prevention of poverty and destitution (as well as in the provision of relief) is possible through the close co-ordination of the activities of the public health nurse and the social worker.

Has all this effort brought any substantial prolongation of life, any reduction in the volume of sickness and death or added materially to the joy of living and increased the opportunities for useful service to one's fellows? To answer these questions requires access to the records of the volume and kind of mortality and morbidity over many decades and a clear appreciation of the limitations of such information. In Canada the registration of births, deaths and causes thereof is a recent development, at least in many parts of the country. Sickness records, except for quite incomplete returns of certain of the communicable diseases, are not available. Furthermore, population figures for the whole country for even the past fifty years are not entirely satisfactory. For these reasons answers to the questions can not be forthcoming based upon Canadian experiences. What of other countries or communities?

In England and Wales the crude general death-rate for the decade 1871-1880 was 21 per 1,000 living; in 1924 it was 12; the infant mortality rate in the same period fell from 149 to 75 per 1,000 living births. Mortality due to typhoid fever has dropped from 37 per 10,000 of population to 1.2. In 1875 in England and Wales 1,500 deaths from typhus fever were reported; in 1924 there were only five. In 1847, in the same country, the death-rate from tuberculosis of the respiratory system was 318 per 100,000 population; in 1926 it was 73. The increase in expectation of life is shown in the next table:

TABLE VII

LONDON LIFE TABLE, 1841-1922

Period	Expectancy of Life (Years)		Period	Expectancy of Life (Years)	
	Males	Females		Males	Females
1841-50	34.6	38.3	1891-1900	41.2	45.4
1851-60	36.4	40.4	1901-10	47.2	51.9
1861-70	35.7	39.9	1911-12	49.5	54.5
1871-80	38.0	42.4	1920-22	53.8	59.1
1881-90	40.1	44.5			

These data are submitted largely because they are typical, and indicative of the public health progress of the past half century. Similar advances have been made very generally throughout the civilized world. These figures answer in part the questions submitted. Obviously reduction in mortality and morbidity means for many people diminished sorrow and less suffering, but not necessarily increase in joy of living or opportunity for fuller and more useful lives. These are the social and economic aspects of the question which are difficult to analyse and really outside the scope of the present paper even though of the highest importance and of great practical interest.

Before considering in detail present problems and possible future developments of preventive medicine let us quickly review some further evidence bearing upon the results of the efforts of the past two or three decades.

In general it may be said that being an infant is much less hazardous than formerly. The following table makes this abundantly clear.

TABLE VIII

DECLINE IN MORTALITY ENGLAND AND WALES IN EACH YEAR UP TO FIVE*

Period	Per 1,000 births	Per 1,000 survivors			
	0-1	1-2	2-3	3-4	4-5
1871-75	153	59	28	19	14
1876-80	145	58	27	17	13
1881-85	139	53	23	15	12
1886-90	145	53	22	14	10
1891-95	151	52	21	14	10
1896-1900	156	49	19	13	9
1901-05	138	41	16	11	8
1906-10	117	35	14	9	7
1911-15	110	35	14	9	6
1916-20	90	29	14	9	7
1921-25	76	21	9	6	4
1920	80	26	11	7	6
1921	83	19	9	6	4
1922	77	25	11	7	4
1923	69	19	8	5	4
1924	75	22	9	5	4
1925	75	22	9	5	4
1926	70	18	8	5	4
1927	70	20	9	5	4

*Annual Report of the Chief Medical Officer of the Ministry of Health, England and Wales, for the year 1927.

A less satisfactory state of affairs, however, is revealed if we consider the still very serious risks of child-bearing. Everywhere cognizance is being taken of this fact, and the following table indicates clearly how essential is the need of careful inquiry and suitable action.

TABLE IX
MATERNAL MORTALITY
(ENGLAND AND WALES)

Year	Births registered	Deaths of women classed to Pregnancy and Child-bearing				Deaths of women not classed to Pregnancy and Child-bearing but returned as associated therewith	
		No.	Rates per 1,000 births registered				
			Puerperal Sepsis	Other Puerperal Causes	Total Puerperal Mortality	No.	Rate per 1,000 births registered
1911	881,138	3,413	1.43	2.44	3.87	909	1.04
1912	872,737	3,473	1.39	2.59	3.98	848	0.97
1913	881,890	3,492	1.26	2.70	3.96	803	0.91
1914	879,096	3,667	1.55	2 62	4.17	831	0.95
1915	814,614	3,408	1.47	2.71	4.18	881	1.09
1916	785,520	3,239	1.38	2 74	4.12	739	0.94
1917	668,346	2,598	1.31	2.58	3.89	638	0.95
1918	662,661	2,509	1.28	2.51	3.79	2,529	3.81
1919	692,438	3,028	1.67	2.70	4.37	1,337	1.93
1920	957,782	4,144	1.81	2.52	4.33	1,086	1.13
1921	848,814	3,322	1.38	2.53	3.91	925	1.09
1922	780,124	2,971	1.38	2.43	3.81	1,051	1.35
1923	758,131	2,892	1.30	2.51	3.81	764	1.01
1924	729,933	2,847	1.39	2.51	3.90	849	1.16
1925	710,582	2,900	1.56	2.52	4.08	759	1.07
1926	694,563	2,860	1.60	2.52	4.12	709	1.02
1927	654,172	2,690	1.57	2.54	4.11	861	1.32

(Based upon data contained in "Protection of Motherhood", by Dame Janet Campbell, Reports on Medical Subjects No. 48, Ministry of Health, England and Wales, 1927.)

Between the ages of one and five years mortality trends have also been downward and the same is true until the fifth decade of life is reached. In the higher age-periods, however, the trends are not such as to give rise to other than genuine concern. Some of the causes of death in the later decades of life in which the trends are definitely upwards are shown in the following:

TABLE X
MORTALITY RATES FOR CANCER, NEPHRITIS AND CIRCULATORY DISEASES FOR 5 OLDER AGE GROUPS
ONTARIO, CANADA
Average Annual Rate per 100,000, 1881-1885; 1921-1925.

Year	Cause of Death	40-49	50-59	60-69	70-79	80+
1881-85	Cancer	36	81	128	200	210
1921-25		88	213	473	816	1,000
1881-85	Nephritis	17	24	58	109	114
1921-25		34	69	177	403	740
1881-85	Circulatory Diseases	60	124	278	490	430
1921-25		89	256	823	2,500	5,730

Very brief consideration of the communicable diseases as factors in general mortality reveals certain facts of considerable interest. Those diseases for which methods of specific prevention and serum therapy (vaccination or active immunization) have been developed are being brought under control. The same is true of those diseases in which vigorous educational work has been combined with the provision of adequate diagnostic and treatment facilities, as in tuberculosis. Progress is also being made in dealing with syphilis because of earlier diagnosis and improvement in treatment, since it is specific and usually more prolonged. There, too, the value of popular health educational effort has been demonstrated.

Communicable diseases, which are spread through and by water and foods, are susceptible of almost complete control by the institution and maintenance of those elementary sanitary requirements of any community, pure water and clean food. Hence typhoid fever, dysentery, Asiatic cholera, etc., should never again be menacing problems in preventive medicine. Then, too, for these "enteric" infections there are specific methods of prevention.

Among all the communicable diseases the situation is least satisfactory in respect of prevention and treatment in the group of acute respiratory infections. Influenza is still a baffling problem and may again sweep round the world in pandemic form with disastrous consequences. The pneumonias continue to take great toll of human lives. The so-called "common cold" as a cause of temporary disability and consequent economic loss is most decidedly one of the unsolved problems in this field.

These problems in preventive medicine may be considered from several viewpoints when plans for their solution are under consideration. Some clearer conceptions will emerge if we consider them under such subdivisions as:

(1) Those diseases or slight deviations from the normal in which the prime requisite is further research and investigation into causation and later the development of suitable methods of prevention and treatment. Many conditions will fall into such a category. This is perhaps the first great need in the present or future advancement of preventive medicine. Research and still more research! Investigation at the bedside, in hospital or home, in the laboratories, in the clinic, indeed at all times and in all places where the well or sick come under medical observation! Well persons who desire to receive routine periodic health supervision may in future provide much clinical work for physicians. Furthermore, these "health clients" will probably furnish many difficult problems. The presumed healthy person, who is a "health client", is primarily interested in being maintained in a condition of vigorous bodily and mental health. In the achievement of this most laudable aim the physician, who is a practitioner of preventive as well as curative medicine, may assist. The value of the service which may here be rendered, however, will depend in large part upon the acquisition of further knowledge of the early signs and

symptoms of disease. It is assumed, of course, that such additional knowledge, when gained, will be possessed by physicians in general and furthermore will be utilized by them.

In this category of future preventable causes of death and disability may be included: cancer; the degenerative diseases of the heart, arteries and kidneys observed in persons in early middle life; the causes of death in the puerperium other than those due to sepsis, eclampsia, etc.; deaths in the neonatal period (the first week of the first month of life); influenza and the large bulk of the pneumonias; and diseases of the nervous system. This list is, of course, quite incomplete but is illustrative.

(2) Other diseases where in the present state of knowledge almost complete prevention and control is possible such as: smallpox, diphtheria, typhoid fever, scarlet fever, rabies, and perhaps some other transmissible diseases. In addition one might include those conditions which could be reduced in their incidence by appropriate measures, such, for example, as the use of convalescent serum in the prevention of measles. More effective action against these diseases awaits a more general knowledge and understanding among the masses of the people of what is realizable in the field of prevention. Two other conditions, it seems, must also be met before any substantial improvement can take place. These are the creation of local health organizations everywhere throughout the country in rural and urban communities alike. These must be suitably staffed and there must be a close working relationship between such public health units and the medical, dental, nursing and veterinary professions, so that the nation's entire resources may be unified and co-ordinated in the struggle against preventable disease. That this is neither academic nor impracticable will be realized by everyone who considers what was accomplished during the Great War as a result of organization. It seems inconceivable that any great body of intelligent people will fail indefinitely to take cognizance of these facts.

Early in the period when cities, states and provinces organized public health services, the necessity of making provision for the care of persons suffering from certain diseases was recognized. Hence "fever" or isolation hospitals and institutions for the care of the mentally abnormal and subnormal were established and maintained. At the outset certain definite distinctions were made between patients received in the types of hospital mentioned and those receiving treatment in general hospitals. The first distinction, perhaps, or at any rate an outstanding one, was this: The patient in the fever hospital was recognized as a source of possible danger to others, and this was a stimulus and incentive for the practice of any and all measures of prevention. Then, too, the economic consequences of the occurrence of such cases were soon appreciated. Finally, the individual suffering from a communicable disease came really to occupy almost a preferred position in respect of the consideration shown him by the state in the provision of diagnostic and treatment facilities. All of

this is regarded as reasonable. The question at once arises, however, since the measures so far introduced are justified, is it not desirable to take the next step and make arrangements so that health supervision will be made available for persons of all ages and of any economic or social condition? In other words, provide that curative and preventive medicine shall no longer be separated, in so far as the state takes cognizance of them. Recognize rather that they are essentially two phases of one activity both of which are necessary for the fullest realization of the objectives already set forth.

In order to develop this thesis at somewhat greater length it will perhaps be wise to recall for the moment the situation as it obtains in many communities in Canada at the present time. In a relatively small number of municipalities and (with perhaps a dozen exceptions) only in larger urban centres are there well-organized health departments with adequate appropriations and the necessary personnel. Elsewhere very much remains to be accomplished before local health organization is completed. On the side of curative medicine there are hospitals, special and general, to the number of approximately 570 to 600 in Canada with about 55,000 to 60,000 beds. There are believed to be about eight thousand physicians actively engaged in the practice of medicine. There are perhaps one thousand in addition in other fields, such as research, teaching, public health, hospital administration, direction of medical or lay organizations, etc.

We have a large volume of mortality, the extent of which is definitely known, its causes in part understood and in part obscure; a great deal of sickness, the precise amount and kind not definitely known, although sickness surveys made in the United States indicate that about two per cent of wage-earners in any community are seriously ill at any given time. Some of this sickness is promptly and satisfactorily dealt with; much of it is probably unattended or seen late when valuable time has been lost. Thanks to the care with which sickness data are compiled under the National Insurance Act of England and Wales it is possible to obtain some further idea of the volume and kind of sickness observed among many millions of insured persons. This material is based upon insurance medical records of panel practitioners.

In the year 1924 it is estimated that there were 13,600,000 persons in England entitled to treatment and attendance during illness. In that year between 45 and 50 per cent of the insured population received medical treatment. It was estimated that the time lost through sickness among this group in 1924 was approximately twenty-three and one quarter million working weeks. Scrutiny of the records of 553 medical practitioners in four hundred areas, rural and urban, covering 903,000 insured persons on the lists of these practitioners elicited the information that the causes of sickness in the group were those shown in Table XI on page 70. For the purpose of this illustration a representative sample of from 100 to 300 records with a diagnosis was taken. The total number of selected records was 92,135 and the cases of illness shown on them were 107,796.

TABLE XI

PROPORTION OF CERTAIN DISEASES TO TOTAL CASES AMONG INSURED PERSONS IN REPRESENTATIVE AREAS, URBAN AND RURAL—1924

Disease	Total		Male		Female	
	No.	Per 1,000 of total	No.	Per 1,000 of total	No.	Per 1,000 of total
1. Influenza	14,068	130.5	9,950	137.7	4,118	115.9
2. Tuberculosis, all forms	1,215	11.3	790	10.9	425	12.0
3. Organic Heart Disease	1,458	13.5	1,014	14.0	444	12.5
4. Anaemia	2,261	21.0	135	1.9	2,126	59.8
5. Bronchitis, bronchial and nasal catarrh, cold, etc.	20,996	194.8	14,535	201.1	6,461	181.9
6. Pneumonia and other diseases of the respiratory system	1,840	17.1	1,412	19.5	428	12.0
7. Diseases of digestive system	12,798	118.7	8,374	115.9	4,424	124.5
8. Diseases of genito-urinary system	2,732	25.3	1,134	15.7	1,598	45.1
9. Diseases of nervous system and special senses	4,887	45.4	3,099	42.9	1,788	50.3
10. Skin Diseases	3,955	36.7	2,405	33.3	1,550	43.6
11. Injuries and accidents	11,305	104.9	9,745	134.8	1,560	43.9
12. Abscess, boils, other septic conditions	8,196	76.0	5,734	79.3	2,462	69.3
13. Lumbago, rheumatism, etc.	10,073	93.4	7,444	103.0	2,629	74.0
14. Debility, neuralgia, headache	5,360	49.7	2,606	36.1	2,754	77.5
15. Malignant Disease	204	1.9	149	2.1	55	1.6
16. Other diseases	6,448	59.8	3,746	51.8	2,702	76.1
Total	107,796	1,000.0	72,272	1,000.0	35,524	1,000.0

It should be reiterated that this only indicates the general character of attended sickness among a proportion of the insured population in England in a given year. It gives no information regarding illness which was not attended among the above group of insured persons (the first three days of illness are not covered by sickness benefit) and may not reflect the condition of affairs among persons of all ages in the non-insured population. With this reservation, however, certain general conclusions may be drawn. One-third of these patients suffered from acute respiratory infections; nearly fifteen per cent from rheumatism, lumbago, neuralgia, etc.; twelve per cent from indigestion; ten per cent from injuries and seven per cent from local infections, etc.

An illustration of "hospital-treated" disease in a given year in a general hospital in London, England, is shown in Table XII on page 71.

It may be fairly asked at this juncture whether the extension of interest of the organized community—the state—into the problem of non-communicable preventable disease or indeed invalidity in general would be in the best interest of the public. Obviously if all sick persons are able to provide themselves with medical and dental treatment, nursing care in hospital or at home when such is needed, and in addition can afford to pay for health supervision which has come to be regarded

TABLE XII

PROPORTION OF CERTAIN DISEASES TO TOTAL CASES—A LARGE LONDON HOSPITAL IN PATIENTS—1924

Disease	Number of cases	Proportion per 1,000 cases
1. Tuberculosis, all forms	261	18.7
2. Cancer, excluding Gynaecological Cases	603	43.3
3. Organic Heart Disease	149	10.7
4. Other Diseases of Circulatory, Lymphatic and Haemopoietic Systems	398	28.6
5. Bronchitis	169	12.1
6. Pneumonia and other respiratory diseases, excluding Pulmonary Tuberculosis	635	45.6
7. Diseases of the Digestive System	3,396	243.6
8. Diseases of the Genito-Urinary System	710	50.9
9. Gynaecological Cases and Diseases of the Female Breast	1,740	124.8
10. Diseases of the Nervous System and Special Senses	2,007	144.0
11. Skin Diseases	329	23.6
12. Injuries and Accidents	1,082	77.6
13. Acute Inflammations unspecified	390	28.0
14. Chronic Inflammations unspecified	79	5.7
15. Infective Diseases	169	12.1
16. Nephritis and Bright's Disease	126	9.0
17. Congenital Debility, etc.	191	13.7
18. Orthopaedic	660	33.0
19. Diseases of Ductless Glands	310	22.2
20. Venereal Diseases	550	39.5
21. Other diseases	186	13.3
	13,940	1,000.0

as essential, then the problem would not be an economic one but solely a question of education.

Unhappily such is not the case. Satisfactory provision for the necessary requirements in the way of medical and other related services both preventive and curative is for a large part of the population very difficult. Instances in which the occurrence of illness in a member of a family has been followed by disastrous economic consequences are known to all. For many the cost of absolutely essential obstetric and pædiatric service is a major economic problem. Under such circumstances it does appear incongruous to advise additional health supervision to those who are already unable to obtain the necessary service in curative or preventive medicine at their own expense. If this is true then certain inferences may fairly be drawn.

The first is that persons who need such professional care fail to receive it or do so only at a late date after much valuable time has been lost. If these persons have been victims of preventable illness then avoidable economic loss has been incurred by the sick person and by the community at large. It pays to prevent sickness. This is a sound economic proposition, and one on which there is complete

agreement among physicians, economists and all who have given the question careful thought.

It is necessary to appreciate that much preventable sickness lies outside the scope of activities of departments of public health as presently organized. Furthermore, there is a well-founded opinion which is quite widely held, that economic considerations do restrain many people who otherwise would gladly avail themselves of existing facilities for early diagnosis and treatment and for disease prevention.

It has frequently been stated that "well-to-do" persons in any community, and those who are poverty-stricken or destitute, receive the best and most satisfactory care when sick and also such preventive services as can be provided at present. This may or may not be true. In any event it need not deter us in our endeavour to answer this simple question: Is the present system for the prevention of sickness and the provision of medical care in this country the best that can be devised?

If not, the first essential is an inquiry into the facts of the situation. Such an investigation might be undertaken by a group representing the organized medical profession, the federal and provincial departments of health and perhaps representatives of other interested bodies. The Committee on the Cost of Medical Care, recently (1927) set up to explore this field in the United States, illustrates how some of these questions might be approached by a suitable committee. The investigation of Canadian conditions should be made by Canadians. The remedies which might be proposed should be designed primarily to meet our own needs.

Many authorities insist that in actual practice there is no sharp line of distinction between preventive and curative medicine; the practice of both being the function of the physician alive to his opportunities. The scope of work in preventive medicine will expand with a wider appreciation on the part of the general public of the value of health supervision. Furthermore, better service will be rendered by the physician when much more is known of the early symptoms of disease. At the outset there must be very slight deviations from normal function. Important light may be shed upon the nature of such abnormalities by repeated careful examination of presumed healthy persons, when both clinical and laboratory methods are utilized. The removal of every deterrent, which causes persons to hesitate to consult a physician upon the first appearance of any symptom, should certainly be undertaken.

Methods to overcome economic obstacles in the provision of medical, nursing and hospital care have been adopted in many countries. In general, these are of two sorts, voluntary and compulsory sickness insurance. Voluntary insurance against sickness is a wise precaution which is taken by many persons in Canada and the United States at the present time. Such voluntary insurance may simply be a contract between any individual and an insurance company.

There is, in addition, in these countries a very limited form of

sickness insurance which certain fraternal benefit societies provide for their members. This is an arrangement effected by groups or individuals. Then again in certain industries some provision for medical service for employees is made. This is often a joint undertaking on the part of employers and employees and is voluntary in the sense that no one is compelled to enter a particular industry where such a plan of sick insurance is in operation.

In Europe, voluntary insurance institutions exist in a number of countries and the system introduced into Denmark in 1892 has been followed in Belgium, France, Finland, Italy, Netherlands, etc. The Danish system of social insurance against sickness is carried on through and by institutions which existed in the country at the time of its introduction, namely, mutual benefit societies, public relief institutions and charitable societies. The laws dealing with sickness insurance are based upon three principles: voluntary for all persons without means; subsidy from the public authorities; supervision of institutions by state departments. Legal provision is made in Denmark for the organization of sickness fund associations for particular industries or for particular districts. Only persons of the wage-earning classes without means or men and women on that economic level, small farmers, handicraft workers, etc., are eligible for membership in the funds. A definite limit of income or capital is set which varies with the cost of living. Only persons within the prescribed economic limit are eligible for membership. In 1925 about 1,478,000 persons in Denmark were members of sickness associations. This was 57 per cent of the population. It is unnecessary here to give all the details of this form of sickness insurance, but it should be mentioned that general medical treatment, dental treatment and in certain funds, specialist's treatment, are provided by the arrangements between sickness funds and individual practitioners. The relations between the funds and doctors are regulated by agreements existing between committees representing the medical profession on the one hand and sickness funds on the other. Hospital treatment and maternity benefits are also provided under the Danish plan. In 1925 medical attendance was provided at a cost of 14,559,888 Danish crowns or over $4,000,000. Further details of the Danish and other similar national systems of voluntary sickness insurance will be found in "Studies and Reports", series M (Social Insurance), No. 7—Voluntary Sickness Insurance, International Labour Office, 1927.

In the general introduction to the study of compulsory sickness insurance made for the International Labour Office of the League of Nations and published in 1927, this statement appears:

"In spite of its valuable achievements the voluntary insurance movement has been found insufficient and it has become clear that the way to secure general and effective protection against the risk is by making insurance compulsory. The modern state as guardian of public health and national prosperity considers it both a right and a duty to impose compulsion. Even the devotees of individualism admit that in a well-organized community a person should not be free to indulge in improvidence which leads to his becoming a charge

on the rates, and that insurance is a social duty, the performance of which the State may, in the general interest, force."

It is not intended at this time to set out in detail the various reasons which have led to the introduction of sickness insurance in many countries. It is of special interest, however, to learn that a number of authorities on the subject of social insurance believe that sickness and invalidity insurance should have as their primary function the advancement of preventive medicine. Professor G. Loriga, Chief Medical Officer of the Italian Ministry of Labour in May, 1927, emphasized this as follows:

"The object of benefits in kind as applied to accident insurance differs considerably from that which they have in relation to sickness and invalidity insurance. In the former case the principal task to be fulfilled is one of preservation and reconstruction, which ceases with the individual; in the latter the therapeutic function is associated with that of prophylaxis, present or future, and provision is made for prevention of the spread of disease, for improvement of the health of the present generation, and for the creation of more favourable conditions of existence for those to come. Thus, not only the individual but society, as a whole, benefits by it.

"In view of this diversity of function, it might almost be said that accident insurance is an institution established principally for the purpose of affording assistance; the other forms of insurance are in the nature of social welfare institutions and as such form the most valuable auxiliaries of the state policy in relation to public health. In the author's opinion, in view of this difference in the aim of sickness insurance(the scope of which is not alone the restoration of the health of the insured persons, but also the preservation of their physical well-being and that of the whole community), the organization of the medical service should be regarded as a matter of much greater importance, and should be regarded entirely independent of the administrative service."

Sir George Newman, Chief Medical Officer of the Ministry of Health of England and Wales, in his annual report "On the State of the Public Health" for the year 1925, dealing with the insurance medical service, wrote as follows:

"The insurance (medical) practitioner, however, although he fulfils functions of great public importance, is a private medical practitioner who, in virtue of an agreement he has entered into with the local insurance committee, has undertaken to give, in accordance with the conditions of the service, medical attendance and treatment to those insured persons who, in the exercise of their free choice of doctor, elect to avail themselves of his professional services. The service, broadly, is conducted as private medical practice is conducted. The insurance practitioner sees his insured patients in the same consulting room as that in which he sees his private patients. As a general practitioner he brings to bear upon their various ailments the same skill and the same methods of diagnosis and treatment that he devotes to his private patients. In short, the aim of the insurance system is to utilize the private practitioner, not to abolish him or replace him by a public official.

"In the insurance medical service, then, we have created a system which, for the first time in our history, has brought the work of a great body of private practitioners into organic relation to our public organization of preventive medicine. The importance of this step is questioned, but its full signficance is far from being fully realized. There is still a tendency to regard preventive medicine as something entirely built up and maintained by the work of public officers. That public officers have played a great and splendid part

in the development of British preventive medicine is, of course, a fact which all those who are now labouring in the service of the central and local health authorities may be justly proud. But it must not be forgotten that in this great movement the private practitioner has high claims for recognition. The clinical foundations upon which the superstructure of preventive medicine rests were laid in this country in the eighteenth century by medical practitioners who derived their inspiration from that trinity of practitioners which constitutes the chief glory of British medicine, William Harvey, Thomas Sydenham and John Hunter.

"In three respects the insurance practitioner is placed in a position of special advantage in the attack on disease: First, he encounters disease in its beginnings; secondly, he sees his patients in their own homes; and thirdly, his relation to them is not embarrassed by considerations of gain.

"Theee three characteristics of his work are closely related; the first and second, indeed, exist largely because of the third. He sees his patients at the outset of illness, chiefly because no question of fee is interposed between him and them. His patients seek his services early because they have no fear of the doctor's bill before their eyes. Similarly, he can continue his attendance for the full period for which he is needed, without any thought that his assiduity might be misinterpreted and attributed to his desire to run up a long account. And the absence of the cash nexus between doctor and patient in insurance practice is not counterbalanced by the introduction of the element of 'charity'. The insurance doctor receives no fee from his patient, but, nevertheless, he is paid. The patient is not deterred from sending for his doctor by the feeling that he will receive something for nothing. He has paid his insurance premium in the form of weekly contributions, and his doctor is receiving, for his attendance upon him, what an impartial tribunal has held to be adequate payment.

"The insured patient, then, undeterred by considerations of cash or 'relief' sees his doctor early, and the doctor is in a position to observe the early signs of disease and to attack it at the stage when it is most vulnerable. This in itself is an enormous advantage. But there is the further advantage that the insurance doctor sees what the hospital doctor does not see, or relatively seldom sees, the patient's home and its surroundings. Here is a wide field for the observing and painstaking biologist, for the doctor, by the nature of his calling, is essentially a biologist. Thus, the insurance practitioner is in a unique position of advantage to study and deal effectively with the problems of disease that press for solution. Is he making the most of his opportunities? It is too soon to give a definite answer to that question. The service is young. It must have time to make manifest the good that is in it.

"The number of insured persons entitled to medical benefit under the National Health Insurance Act in the year 1925 was, approximately, in England 12,861,000 and in Wales 834,000, making a total of 13,695,000. The population of England and Wales in 1925 was 38,890,000. The number of persons entitled to medical benefit was, therefore, equivalent to rather more than one-third of the total population; and in considering the national importance of the service it must be remembered that these insured persons, both men and women, were bread-winners, on whose health, and consequent capacity for earning, the living of the great majority of the remainder was dependent."

"The number of insurance practitioners in 1925 was in England 12,920 and in Wales 907, total 13,937 (of a total of about 26,000 general practitioners). The average number of insured persons on a doctor's list was 957. The total cost of medical benefit in 1925 in England and Wales was £8,280,300 ($40,-242,258) of which approximately £6,441,138 ($31,158,131) was devoted to the remuneration of doctors and £1,869,162 ($9,084,127) to the provision of medicines and appliances.

"The Insurance Medical Service, up to the present, has remained a service of general medical practitioners. It provides such services as an ordinary

general practitioner gives to his private patients. It does not provide specialist services. In this respect it has laboured under unforeseen disadvantages. It was never contemplated in the early days of national health insurance that in the thirteenth year of medical benefit the general practitioners of the service would be driving a solitary furrow—working without any provision by the state in the form of assistance from colleagues possessing special experience and skill in other fields of medical science and art. Before medical benefit had been in operation twelve months the question of providing a comprehensive scheme of consulting, nursing and laboratory services was prepared, and the necessary funds were voted by Parliament. The war, however, was fatal to the scheme, and the money was not available. But the need for the additional services never ceased to be felt. It was expressed strongly in the evidence placed before the Royal Commission on National Health Insurance and is fully recognized in the Report of the Commission."

A feature of very great importance in this system of medical service is the free choice of doctor by the insured person. An insured person may at any time change his doctor and, as a result, since 1924 less than one per cent of insured persons have expressed their dissatisfaction by change of doctor. Furthermore, the fears entertained that insured persons would feign illness to secure benefits have not materialized. Dr. Alfred Cox, Medical Secretary of the British Medical Association, in a review entitled "The Medical Profession and Health Insurance in Great Britain" which was published in 1925, wrote: "Experience has shown that malingering is nothing like as common as many feared it would be." In the British scheme of sickness insurance the capitation fee per insured person is 9 shillings per annum, and the average number of attendances per insured person is 3.8, according to figures obtained by the British Medical Association. Thus the average fee for each item of attendance is 2s. 6d. On the average, it is stated, one of these attendances would be a domiciliary visit and the others office visits.

According to Dr. Cox, the broad results of the British system so far as the public is concerned are:

(1) A greater sense of security in time of sickness on the part of the whole insured population.

(2) A service which, in spite of its incompleteness, gives a large number of the population ready access to medical treatment of a kind superior to what they had in pre-insurance days, and a guarantee as to quality of service, greater than private patients possess.

(3) A greater interest in the question of medical service on the part of the community in general.

(4) A realization that the present service is incomplete and a desire to make it complete for all those at present insured, with an extension to their dependents in the near future.

So far as the medical profession is concerned there are:

(1) A feeling of greater financial security among the doctors who serve the industrial population.

(2) Certain restrictions on the liberty of the individual doctor in his dealings with his insured patients; these may or may not be inevitable in a system in which a third party, the state, intervenes between

the doctor and patient, but they are certainly resented by many doctors and by many patients.

(3) An increasing sense of the collective responsibility of the medical profession for the quality and standard of the service; and

(4) A strong conviction that "the price of liberty is eternal vigilance", with a corresponding increase in the belief of the profession in the necessity for strong organization for their own protection.

In 1924, in the section on Medical Sociology of the British Medical Association, a symposium on health insurance was held to which I desire to direct attention. Representatives of all interested groups in the community had a place on the programme. A detailed account of the proceedings of this meeting was published in the British Medical Journal of August 2nd, page 167. The very interesting summaries contributed by all who took part in the programme set forth the conclusions arrived at, after twelve years' experience with national health insurance.

I should like to suggest that a splendid opportunity is afforded the organized medical profession of this country to undertake a task of national interest and importance as follows: To ascertain whether adequate and satisfactory medical service, preventive and curative, is within the reach of all persons in need thereof; to learn whether the present volume of sickness with its attendant economic loss may be lessened; if so, suggest ways by which this might be achieved; to study the remedies, already introduced elsewhere, for the alleviation of analogous conditions and finally to bring forward specific recommendations to the proper bodies, governmental and voluntary, so that appropriate action may be taken.

The spirit of scientific inquiry should animate such an undertaking. A dispassionate and wholly objective attitude of mind is essential if information of any value is to be obtained. The responsibility cannot be evaded nor can the work involved be delegated to others.

The interest of Gordon Bell in preventive medicine in its varied aspects was known to you all. That interest explains why I have ventured to bring these considerations to the attention of the Winnipeg Medical Society.

Bovine Infectious Abortion and its Relationship to Public Health*

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MY task to-day is one of considerable difficulty since you have asked me to deal with an infection around which a very voluminous literature has grown, and this infection is so interwoven with other factors, such as its relationship to other domestic animals, problems of nutrition and secondary infection, that it makes the problem one of extreme complexity. Added to all this is the comparatively recent discovery of the bacteriological relationship of infectious abortion and Malta fever. You will therefore, I presume, pardon me if I deal but superficially with the problem as a whole, and if I fail to deal adequately with certain phases that are worthy of close consideration.

In order that we have a better understanding of infectious abortion and its relationship to public health it is necessary that we trace through in a very elementary way the history of a few of the investigational efforts directed against infectious abortion and against Malta fever, that we may glean, as it were, a few of the high lights of the subject.

The first light was thrown on the cause of *Malta fever* when Bruce[1] in 1887 isolated from the spleen of a man who had died an organism which several years later was named Micrococcus melitensis. The next advancement was made by Wright in 1897 when he discovered agglutinins in the blood of patients that were or had been infected. This was a distinct advance as it gave a specific means of differentiation of Malta fever, from other fevers of unknown origin. The next advance was made by Zammit[2] in 1905 when he discovered by accident that the causative agent of Malta fever was harboured in the milk of goats. This was the key that opened the secret of the epidemiology of the infection. From that time on the struggle against Malta fever has been to a great extent a struggle against melitensis infection in goats. It is interesting to note that goats show no clinical evidence of infection, save abortion, which takes place in a large number of the infected animals and which may re-occur for several periods of gestation.

Bovine infectious abortion which is of great economic importance to the cattle industry in all parts of the world is an infection that has as its principal symptom the abortion of the foetus. This symptom occurs usually once and rarely more often than twice, while the infection continues in many cases for the life of the animal. Because of the great economic loss connected with this infection it has been one

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of prime importance in comparative medicine for many years. In addition to the original infection frequently secondary infections, such as pyogenic endometritis and mastitis are grafted on, and it is these secondary infections that cause the greater economic loss in connection with the disease.

Since the commencement of last century the infection has been looked upon as contagious but it was not until 1896 that Bang[3] of Denmark isolated the causative agent. Following this discovery many workers, including M'Fadyean and Stockman of England, Priesz of Hungary, Holth and Wall of Denmark, Nowak of France, Zwick of Germany and Schroeder and Cotton of the U.S., have made important contributions to our knowledge. It would serve no useful purpose in a paper of this kind to review the work of each author.

One point is of especial interest, however, in connection with public health; that is the discovery by Schroeder and Cotton[4] in 1911 that the organism, Br. abortus, is eliminated in the milk of many infected cattle, and even at that early date Schroeder especially urged upon public health bodies the danger of the organism. Concisely, his argument was that the organism infects various mammals, that it had not been proven harmless to man and, that therefore it should be considered potentially dangerous until more definite and precise knowledge was obtained. How clear was this conception, we of the present day are in a position to judge. The work of Schroeder and Cotton caused a wave of interest at the time but this gradually died down and the subject was almost forgotten.

The discovery of Miss Alice Evans in 1918[5] that M. melitensis (Bruce) and the B. abortus (Bang) are similar united the two subjects of Malta fever and bovine infectious abortion and from a public health standpoint it is impossible to-day to divorce one from the other.

One point that impresses us was the extraordinary fact that although M. melitensis was isolated in 1887 and B. abortus in 1896, yet 22 years were destined to elapse before it was discovered that they were so closely related. Perhaps it is pertinent that laboratory workers ask themselves why such a long period of time elapsed before this comparatively simple observation was made. It seems to me there are four reasons: First, the relative indifference with which workers in human and comparative pathology regard the others' work. While there are many notable exceptions to this, still it must be admitted that in general it is true. We in Canada have perhaps less excuse for this state of affairs than others, especially when we remember that the father of Comparative Pathology in Canada was a human pathologist of note and later one of the greatest physicians of his day; and had the example set by Sir William Osler been followed by us, it seems scarcely possible that 22 years would have elapsed before the observation of the similarity of the two organisms was made. Second, the advances that have been made in serological methods and studies. Third, the classical bovine symptom was looked for in women when *Br. abortus* infection of humans was suspected. Fourth, because the Brucella melitensis and

the Brucella abortus are the organisms of negation, *i.e.*, they are gram negative non-motile, do not ferment sugars, do not form indol, do not reduce nitrates, nor liquefy gelatine; in fact, all their characteristics seem to be negative.

Following the discovery of Miss Evans a second wave of interest was aroused, and we have as a consequence the finding of Br. abortus infection of man failing to cause the classical symptoms of the bovine infection and usually taking the form of an undulant fever. It is not necessary to go into the recent literature in connection with this since you are all familiar with it. I would like to mention, however, that the first cases recorded in Canada were by Harris, McCoy, Stevens, and Lyman[6], and by McLean, McKinnon, Young and Jeffrey[7].

In connection with Br. abortus infection in man I believe we should not draw too many conclusions on this subject until more complete evidence is obtainable. I am especially mindful of the many times in which what appeared to be facts regarding bovine infection turned out to be suppositions. I think therefore that very conservative conclusions should be drawn at present in order that the literature of the future be not confused.

Serological examinations of bovine sera in our laboratories show that about 20 per cent of the animals tested are infected. Assuming that this represents a fair average of infection in our dairy herds, and taking a conservative estimate of 5 per cent of reactors eliminating infectious abortion organisms in their milk, we would conclude that 1 per cent of the dairy animals are eliminating Br. abortus organisms. I do not give these as authoritative figures and I wish to emphasize that they are based on a limited number of tests. But it may be said at least that, since tests have shown that infectious abortion is distributed throughout Canada from the Atlantic to the Pacific, those who drink milk in this country are daily consuming Br. abortus organisms. Now if ordinary strains of Br. abortus were very infectious for man—say, as infectious as the true melitensis strain—should we not have a veritable epidemic of abortus fever? There would therefore appear to be reason for believing that there is some factor governing Br. abortus infection of humans with which we are not acquainted.

Some of the factors that may conceivably play a part in infection of human beings are:

(1) Strains—It is known that a wide variation exists in the pathogenicity of different strains from bovine sources, and it is known that porcine strains are more pathogenic than bovine strains. It is conceivable that certain bovine strains may be more pathogenic for man. Moreover, little is known except from the classification by Miss Evans of the distribution in man and animals of the various serological types. At our laboratories at the present time we are making a survey to find what serological types affect bovines in various parts of Canada. It would be interesting if each human case occurring in Canada were typed and a correlation of our work might throw more light on the etiology of the infection.

(2) Individual susceptibility.

(3) Dosage of organisms.—Infection to some extent is dependent on dosage. Two ways in which this may play a part are an increase in the incidence of bovine infection, and an increase in milk consumption.

PATHOLOGY OF BRUCELLA ABORTUS INFECTION OF CATTLE

There is a widely entertained hypothesis that infectious abortion is a disease of the uterus, conveyed from animal to animal by the vaginal route, that infection does not take place prior to pregnancy, that infection ceases with the last abortion and that some animals eliminate the causative organism in their milk.

In fact the above is roughly the conception which early workers had of the infection, and on the surface it appears quite reasonable. But when suppositions are put to the cold test of experimental research they are frequently found erroneous and views that appeared sound are found to be mistaken. In clearing up many problems in the etiology of this infection probably no workers have done more than Schroeder and Cotton, and if I fail to mention the many others it is not that I do not appreciate their work but the problem is too great for careful review.

Carefully controlled experiments have shown the following: First, that the Brucella abortus is not found in the uterus except during pregnancy and for a few weeks following delivery. Secondly, that infection usually takes place by the alimentary tract and artificial infection may take place through the udder, through the mucous membranes of the eye, by the subcutaneous and intravenous routes, but so far attempts to infect by the vaginal route have been negative. Thirdly, abortions take place once or twice for the one infected animal but the infection does not necessarily clear up and may persist for the life of the animal. Fourth, abortion does not always take place in each infected animal, *i.e.*, animals infected and harbouring the organism in their mammary gland, or uterus during pregnancy may never abort. Fifth, pregnancy is not necessary for infection. We have shown in our laboratories that virgin animals may develop infection but adolescence seems necessary for infection. In this connection it is interesting to note the small number of infections that have so far been recorded in children, and the question naturally arises does adolescence play any part in human infections. Sixth, the mammary gland and adjacent lymph glands are the only tissues which have been shown to harbour the organism in the absence of pregnancy, but surprisingly few histological changes take place in these tissues. It seems likely that this involvement of the mammary gland makes infectious abortion of cattle a public health problem.

Serological Diagnosis—For many years serological methods have been used for the diagnosis of this infection, and indeed only by serological methods may the majority of cases be diagnosed. Attempts to control infection and build up abortion-free herds may only be done

when a precise and exact method of diagnosis is at hand. Agglutination and complement fixation methods have been used, some workers favouring one, some the other method. At our laboratories we have carried on a careful study comparing the two methods. We have found that it is necessary to employ both methods if one wishes to determine all infected animals. Using either test a small number of cases are found that do not react by the ordinary routine methods because of the presence in the serum of inhibitrice which gives "free zones" to certain dilutions. Reference to the following table will assist one to understand this matter.

COMPARISON OF COMPLEMENT FIXATION AND AGGLUTINATION TESTS ON NINE SPECIMENS

Dilution of Serum	Specimen No. 30	No. 45	No. 46	No. 49	No. 76	No. 85	No. 60	No. 97	No. 108
	Agglutination Results								
1/10	+	+	+	+	+	−	+	+	+
1/25	+	+	+	+	?	−	−	+	+
1/50	+	+	+	+	−	−	−	+	+
1/100	+	+	+	+	−	−	−	+	+
1/200	+	+	+	+	−	−	−	+	+
1/500	−	+	+	+	−	−	−	+	+
1/1000	−	+	+	+	+	−	−	+	+
1/2000	−	−	−	−	+	−	−	−	+
1/3000	−	−	−	−	−	+	+	−	+
1/4000	−	−	−	−	−	+	+	−	+
1/5000	−	−	−	−	−	+	+	−	+
1/6000	−	−	−	−	−	−	?	−	+
	Complement Fixation Results								
2/10	−	−	?	−	+++	++	+++	−	−
1/10	−	−	+	?	+++	+++	+++	−	−
1/20	−	−	++	+	+++	+++	+++	?	−
1/40	?	?	+++	++	+++	+++	+++	+	−
1/80	+	+	+++	++	+++	++	+++	++	?
1/160	++	+++	+++	+	+++	+	++	++	+
1/320	+++	+++	++	−?	++	?	++	+	+
1/640	++	?	?	−	+	−	−	−	?
1/1280	?	−	−	−	?	−	−	−	−
1/2560	−	−	−	−	−	−	−	−	−
S.C.	−	−	−	−	−	−	−	−	−

It is apparent from the above that it is necessary to employ both tests in ordinary routine work, since some positive sera give a "free zone" reaction in the lower dilutions.

Besides these two serological methods we have the M'Fadyean-

Stockman skin reaction, introduced by these workers many years ago. I notice that it has been lately revived under the term Burnet's reaction. It is a reaction analogous to the tuberculin reaction. It has proven of little use in this infection, as it is not sufficiently sensitive.

Live Vaccines—I wish particularly to direct attention to the product known as the live vaccine.

It was found early in the study of bovine infectious abortion that a killed bacterin conferred no immunity. Since the actual abortion was found to be a self-limiting symptom of infection (infected animals aborting once or possibly twice) the use of live organisms was conceived with the idea of stimulating the formation of anti-bodies in healthy animals prior to conception, and thereby later during pregnancy protecting the animal against placental disease and the resulting abortion. The product is simply a suspension of viable Br. abortus organisms, and it is injected subcutaneously at a time favourable to pregnancy. In other words, the animals are infected and sufficient time is allowed for the formation of anti-bodies before conception.

This form of vaccination was at one time very widely used, and even to-day is being used to a considerable extent. Several years ago objections were raised to its use, principally on the ground that while to some extent it might control the symptom of abortion, still it resulted in a great increase in the number of infected animals and Br. abortus carriers. In the light of our knowledge to-day, this form of vaccination takes on a more serious aspect, and most imperative reasons exist for discontinuing its use, since this method must enormously increase the number of organisms in our country's milk supply. I will quote one experiment from the work of Hart and Traum[8]. 16 animals known to be free of infectious abortion were inoculated subcutaneously with live vaccine; 10 of these animals at times subsequent to inoculation, varying from 7 to 55 days, commenced to eliminate Brucella abortus organisms in their milk and continued to do so over a period of several months; in fact, were still eliminating organisms when the experiment was reported and the authors thought that the animals had become chronic carriers.

Since every animal in a herd treated by the live vaccine method is inoculated with the culture, it is at once apparent that the number of animals eliminating abortus organisms in their milk is greatly increased. Dr. E. A. Watson, Director of our laboratories, was one of the first to condemn this method of vaccination, and we do not issue from our laboratories this biologic product.

In low grade infections, such as infectious abortion, the formation of anti-bodies is to a great extent dependent upon the pathogenicity of the strain. It follows that many workers in the field of vaccine therapy prefer to use strains of marked pathogenicity for infections of this type. It is therefore apparent that many workers would prefer Br. abortus strains of the highest possible pathogenicity including even those from porcine sources.

No better plan could be followed for the seeding of strains of this

nature in the dairy herds of this country than the inoculation of a live vaccine containing such organisms. If these strains are more pathogenic for man than ordinary bovine strains, the use of the live vaccine may assist in explaining why infectious abortion of cattle has recently become a public health problem.

When we bear in mind that infection is often dependent upon dosage, that some of our cultural strains may probably be more pathogenic for human beings than the ordinary strains of Br. abortus, that man is susceptible to at least some Br. abortus strains, this method of vaccination with live vaccines would appear to be one fraught with potential danger to the health of man.

SUMMARY

1. That we may the sooner understand the etiology, and the better control infection by the Br. abortus in the various species of mammals, a close co-operation should exist between those working in the fields of human and comparative pathology.

2. Factors which may conceivably govern human infection have been discussed.

3. In testing sera for Br. abortus infection, the advantages of using both agglutination and complement fixation tests have been shown.

4. The product known as the live vaccine is a potential source of danger to man.

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Undulant Fever in Ontario*

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As a problem in the field of public health, undulant fever as caused by the organism Brucella abortus is one of recent origin in this country. The first published reports of cases of this infection in man occurring in Canada appeared in the Public Health Journal of June, 1928. Undoubtedly, previous cases had occurred but had either been passed by undiagnosed, or if diagnosed, had not been reported in the literature in this country.

Contagious Abortion in Cattle

Contagious abortion occurs in the herds of our province to such an extent that it presents a vast economic problem. The most common mode of infection is by ingestion though it may also be intravaginally. The incubation period of bovine infectious abortion is varied by the amount and the virulence of the organisms and the susceptibility of the animal. Bovine abortion may occur at any time throughout pregnancy but frequently it occurs at the fourth or fifth month. If the abortion occurs early in pregnancy the act may pass unnoticed, especially if the animal is at pasture. Susceptible animals may abort once, a few twice and a very small number may abort a third time. Sequelae of cervicitis, endometritis and ovaritis are rather common. In many instances the animal becomes sterile and of no further use as a breeder. The offspring, if born alive, are weak and fatal pneumonia frequently follows. Following the abortion the infective agent is present in the uterine discharges for several weeks. The organisms are present also in the milk and in many instances continue to be present throughout the lactation period as has been shown by Schroeder, Evans, Cotton and Steck by cultural methods. Traum and others have isolated the organism directly from amniotic fluid and from the liver of aborted pigs.

Brucella Abortus

In 1897 Bang isolated a bacillus, now known as Brucella abortus, and identified it as the probable cause of infectious abortion in cattle. This organism has been isolated many times since in Europe and on this continent. It is very small, 1 to 2 μ long and 0.3 to 0.8 μ broad; it is pleomorphic on culture media and involution forms occur as branched and clubbed types. It is non-motile, non-capsulated, does not form spores and is gram-negative. After growth has once been obtained in culture medium it readily adapts itself to ordinary cultural methods.

*Presented at the 17th Annual Meeting of Canadian Public Health Association.

Various methods have been adopted for the isolation of the organism. One strain of Brucella abortus and one of Brucella melitensis were isolated at the Connaught Laboratories and School of Hygiene, University of Toronto, by culturing the clot for 10 days at 37° C. in dextrose broth. Transfers made at the end of ten days showed the fine typical growth but earlier transfers failed to grow. After the second subculturing the organism grew readily. One method employed in the isolation of the organism has been to reduce the oxygen tension of the cultures by adding carbon dioxide. Inoculation of guinea pigs with cream, milk sediments, cultures or tissue is a valuable aid in showing the presence of Br. abortus. The inoculated pigs are left for from 6 to 8 weeks after injection before being autopsied. Cultures of tissue are then made by removing small portions of the spleen, kidney or liver under aseptic conditions and inoculating them on 1 per cent dextrose serum agar and sealing the tube with wax. As Br. abortus has been isolated more frequently from the cream than from the milk sediment and as the organism is pathogenic for the guinea pig, Carpenter suggested injection of cream into the guinea pig as a satisfactory method of determining its presence. The optimum growth temperature is 37° C., although the organism will develop slowly at room temperature.

Br. abortus is relatively resistant to desiccation and will remain alive for several months in a retained mummified foetus and for a year on culture medium. Experimentally Carpenter has found the organism to be fairly resistant in milk and butter. In cream artificially infected with two bovine strains he found that they remained viable for eight days when stored at 8° C. Two strains, 5532 and 5549, inoculated into butter, remained pathogenic for guinea pigs 81 days and 32 days. No infection was found in guinea pigs injected after 142 days and 41 days. Two other strains, one bovine No. 80 and one human, remained pathogenic for the guinea pig up to a period of 10 days. The thermal death point of four strains was studied. Two strains, one bovine No. 80 and one human strain resisted for 10 minutes a temperature of 140° F. while other strains, No. 5532 and No. 5549, failed to show any growth on culture after being subjected to the same temperature for the same length of time. Strains No. 80 and HI(human) failed to survive exposure for 15 minutes to a temperature of 140° F. A porcine (hog) strain was more resistant, withstanding 140° F. for 15 minutes, 142° F. for 10 minutes and 145° F. for five minutes, but failed to grow on culture after being exposed for 20 minutes to 140 F., 15 minutes at 142° F. and 10 minutes at 145° F. Carpenter believes, therefore, that proper pasteurization as recommended for the destruction of the tubercle bacillus, that is 140° F.–145° F. for 30 minutes, is effective also for Br. abortus.

Br. abortus presents four varieties, namely, human, bovine, porcine and equine. The source of the strain does not necessarily mean the nature of that strain. Porcine (hog) strains as a general rule are more pathogenic for the guinea pig than are bovine strains. Carpenter has

found that the lesions in guinea pigs produced by most human strains resemble those produced by porcine strains. Huddleson suggests the use of gentian violet in varying dilutions in the medium as a means of identifying the strains.

Incidence of Br. abortus in Milk

Carpenter and Parshall in examination of the milk supply of Ithaca, New York, showed Br. abortus present in nine herds out of fifty examined. Shroeder and Cotton observed the infection in 25 of 30 cows showing specific agglutinins in their serum diluted to 1-100 or higher. In a study of the milk from 378 cows from 3 certified dairies, Carpenter found the organism by guinea pig inoculation in the milk of 6 per cent of the animals; 20 per cent of the animals showed agglutinins for Br. abortus. The number of abortus organisms present in milk may vary greatly from day to day. The results of the Mediterranean Fever Commission on the number of Br. melitensis organisms present in goats' milk each day showed a variation from none to 30,000.

LABORATORY DIAGNOSIS

Microscopic Agglutination Test

When dried blood specimens are received in the laboratory, a preliminary test is set up using a dilution of 1/40. The technique used is that described by Wadsworth in his book on Standard Methods. The antigen used in this test is an overnight culture of Br. abortus No. 80. The tubes are incubated at 37° C. for one hour. Should agglutination be present in this preliminary test, a second set-up is made, using dilutions of 1/80 and 1/160. Should agglutination be found present in this second test, a request is made for a whole blood specimen.

Macroscopic Agglutination

The organisms, Br. abortus and Br. melitensis, are grown on liver agar at 37° C. for 48 hours. The cultures are washed off and emulsified in sterile normal saline. After shaking thoroughly, the preparations are filtered and diluted with sterile normal saline to the density of 1000 million parts per cc.; 0.1 per cent of formalin is added. The flasks are properly stoppered and placed in the ice box for five days. On the fifth day, samples of each are withdrawn and tested for sterility. After the sterility tests are passed, the preparations are distributed in 10 cc. amounts in small glass bottles, capped, labelled and placed in the ice box for use as required.

All whole blood specimens are agglutinated by the microscopic method in dilutions of 1/20 to 1/80 and by the macroscopic method in dilutions of 1/20 to 1/1280. It has been found very satisfactory to do both methods when possible as a check and for confirmation of the results. The sera are inactivated at 56° C. for 20 minutes. The serum saline dilutions are set up in tubes as follows: 1/10, 1/20, 1/40,

1/80, 1/160, 1/320, 1/640 and 1/1280. The eighth tube (control) contains saline and antigen only. 0.5 cc. of Br. abortus antigen is added to each tube in one set and Br. melitensis antigen to each of another set. The rack is shaken for five minutes and placed in the water bath at 37° C. for 4 hours, then placed in the ice box overnight and read the following morning. With several specimens where the amount submitted was sufficient the macroscopic test has been done with live culture as well. The dilutions are set up as previously described and 0.5 cc. of 24 hour liver broth culture is used as antigen. With each day's tests a positive and a negative serum are set up for controls in dilutions of 1/20 to 1/1260.

The Provincial Department of Health has isolated two strains of organisms which resemble Br. abortus morphologically and are agglutinated by abortus sera in a dilution of 1/1280. Both these strains were isolated by culturing the clot in liver dextrose broth. After placing the clot in the tube, the top was sealed with sealing wax. Guinea pigs have been injected with both cultures and further work is in progress to identify the variety of each.

EPIDEMIOLOGY

The first reported proven case of this infection in man was reported by Keefer in 1924. Serum from this case was shown to agglutinate Br. abortus, and its specificity was confirmed by Evans by agglutinin absorption. Since that time there have appeared many reports in the literature of the United States, South Africa, Scandinavia, Italy, and other countries of similar cases. A recent article by Kern reviews the cases reported in the United States and compiles the clinical and epidemiological data available of thirty-six cases. Since the appearance of this article in September of 1928, other reports show a still further number of cases, indicating that as interest of laboratory workers and clinicians is focused more particularly on the diagnosis of this infection its incidence is shown to be much more widespread.

From July 1, 1928, to November 30th, 1928, a period of five months, the following have been the results of agglutination tests on specimens submitted for the Widal test at the Central Laboratory of the Department of Health of Ontario:

Number of specimens submitted	856
" " " positive for B. typhosus	245—28.6%
" " " " " B. paratyphosus B	17— 1.9%
" " " " " Br. abortus	17— 1.9%
Positive blood culture for Br. abortus	2

Of these 17 specimens showing agglutination for Br. abortus in a dilution of 1/160 to 1/2560 we have been able to obtain the clinical history of all of these cases. In 14 instances the clinical history of the case combined with the laboratory findings justified a diagnosis of undulant fever (Br. abortus infection).

An analysis of the points of epidemiological interest of these 14 cases of this infection is as follows:

Age—The youngest patient was a lad of 17 who had been assisting in the work on the farm. The majority of the cases occurred in the age-group of 25-40 years. This is in agreement with the ages of cases reported elsewhere, namely that in nearly all instances the cases have occurred among adolescents and adults. In view of the widespread infection of raw milk with this organism it is anomalous that no cases have been discovered amongst young children who are heavy users of raw milk. So far no one has advanced any satisfactory explanation for this peculiar age distribution. It has been noticed, however, that this same situation occurs amongst cattle infected with the disease. Suckling calves show no evidences of the infection even though the cows are known to be infected and are excreting the organisms in the milk.

Sex seems to play an important rôle in the incidence of this disease. Of these 14 cases, 9 were males and 5 females. This is in agreement with other studies which have been made. In the series reported by Kern 25 were males and 7 females. Probably occupation is a factor in this unequal distribution of incidence as to sex. Males only would come in close contact with infected animals or would be handling the products of abortion of such animals.

The *distribntion* of these cases has been widespread throughout the province. Cases have been reported from all sections of Southern Ontario, from the eastern to the western boundary. This is to be expected owing to the widespread distribution of the disease amongst cattle. Mitchell of Federal Department of Agriculture reports that in general 20 per cent of the cattle in the Dominion are infected and 1 per cent are excreting the organism in the milk. This is not extremely high as it is reported that in the United States 90 per cent of the herds within certain districts were infected and 16 per cent of raw milk examined contained Br. abortus.

The *mortality* from the disease is low; none of our fourteen cases having terminated fatally. Some authorities have given the mortality rate to be from 2 per cent to 3 per cent.

SOURCES OF INFECTION

We next turn to the possible sources of infection of these cases. It has been proven conclusively that Br. abortus is present in the raw milk of some animals infected with this disease. It has also been shown by Carpenter that strains of Br. abortus isolated from blood culture of human cases of Br. abortus infection in man will produce contagious abortion in pregnant animals.

Our attention has been focused on the possibility of these cases having ingested raw milk from herds in which contagious abortion is present or whether they had been in any way handling infected animals for infection may be acquired through skin lesions.

The following is an analysis of the histories of 14 cases:

7 persons drank raw milk.

5 persons drank raw milk from herds known to be infected with contagious abortion.
1 person handled products of abortion.
1 person could give no possible source to which infection could be traced.

In one instance the blood from a cow, the milk of which was used by the patient, showed agglutination of Br. abortus in a dilution of 1/2560. In the light of our present knowledge of the widespread distribution of the organism in raw milk and the apparent infrequency with which the disease is met, we may conclude that either the organism varies considerably in its pathogenicity or there is a wide variation in human susceptibility. From experimental evidence it would appear that the organism itself is of low infectivity. For the final settlement of this point a thorough investigation should be made of a certain area in which there is a known high incidence of the disease in cattle, and where a certain group of the population are using properly pasteurized milk from this source and a group otherwise simila r using raw milk from the same source.

In this series it has been impossible to accurately estimate the incubation period. In one case where the probable source of infection was from the handling of the after-birth of an aborted cow it is noted in the history that this occurred "shortly before his illness". Huddleson reports a similar case, however, where a sixteen year-old boy was working with a new born calf of a cow which was known to be suffering from the disease and just fourteen days later developed symptoms of the disease. The incubation period has been quoted as from ten to fourteen days.

SYMPTOMATOLOGY

As reported to us the disease has varied widely in its severity. The outstanding symptom of all has been fever, usually in the afternoon and evening, and giving a temperature chart of the undulant variety. In many instances the elevation of temperature has been accompanied by chills followed by a drenching sweat. There has usually been persistent headache, lassitude, some anorexia and either constipation or diarrhoea. Loss of weight was noted in some instances. The physical examination has proven negative in practically all instances. In those cases in which blood counts had been made there was usually a leucopenia and the total red blood counts were somewhat reduced. In three cases there was a leucocytosis. Urinalysis was negative or showed only a trace of albumin. It is reported that the organism may be recovered in some instances from the urine of the patient. No cultures from urine samples were made in these cases.

This is one disease in which laboratory aid is almost essential for clinical diagnosis. In only two of the fourteen cases reported here was undulant fever suspected from clinical findings.

The differential diagnosis in these cases has been between typhoid fever, influenza, tuberculosis and malaria. Atypical typhoid fever and

influenza are probably the diseases most likely to be confused with this infection.

CONCLUSIONS

1. Brucella abortus in milk and butter is rendered harmless by proper pasteurization.
2. Macroscopic agglutination test is more satisfactory than the microscopic.
3. Widal work in public health laboratories should include agglutination with Br. abortus.
4. It has been shown that Br. abortus is pathogenic for man, positive blood culture and agglutination having shown the presence of this organism.
5. Fourteen cases of this infection are here reported in which laboratory and clinical findings agree as to diagnosis.
6. These cases were discovered within five months at one laboratory.
7. The laboratory is essential in confirming the diagnosis of this infection.

PREVENTIVE MEDICINE

"The first duty of medicine is not to cure disease, but to prevent it. In its simplest terms, therefore, the purpose of the science and art of Preventive Medicine is to apply human knowledge to the prevention of disease. It is the common and universal experience that life is crippled or curtailed by the occurrence of disease, which leads to a greater or less degree of disablement, incapacity and premature death. To prevent or avoid such disease is to lengthen the period of life and make it happier and more effective."

(*An Outline of the Practice of Preventive Medicine—Sir George Newman, Chief Medical Officer of the Ministry of Health, 1926*).

MAURICE MACDONALD SEYMOUR, M.D., C.M., D.P.H. LL.D.

In the sudden death of Dr. M. M. Seymour on January 17th, in Regina, Saskatchewan, Canada has lost a true public servant who for more than twenty years contributed in a very large way to the development of public health, not only in the Province of Saskatchewan but in all of Canada. He was born in Goderich, Ontario, in the year 1857, and graduated in Medicine from McGill University in 1879.

Dr. Seymour laid well the foundations of public health in the Province which he so dearly loved. Saskatchewan was created a province in 1905, and in the same year he was chosen as the first Commissioner of Health of the newly formed Province. With only the North-West Council Ordinance as authority for health matters, he brought the needs for safeguarding and improving the health of the people constantly before the Government, and enacted within a few years a model Public Health Act, later establishing a Bureau of Public Health, and, finally, the Department of which he was the Deputy Minister until his retirement a year ago. Having reached the retiring age in the service of the Provincial Government, he was asked to continue as special adviser in public health in order that the establishment of rural health units, for which he had laboured, might be completed under his direction.

Dr. Seymour was a man of rare spirit. Courageous, enthusiastic, persevering, he carried out his plans for the welfare of the people with an eye single in its purposes. The splendid Department which he builded was an object lesson to health administrators on this continent. He was the recipient of many honours, having been a Past-President of the Canadian Public Health Association, of which he was one of the few elected to life membership; a Vice-President of the American Public Health Association, of which he was a Fellow. In 1920 he was made a Fellow of the Royal Institute of Public Health, and in 1923 he represented Canada on the Health Section of the League of Nations. Ottawa University honoured him with the LL.D. degree in 1925. In 1926 he was again signally honoured by being elected President of the Conference of State and Provincial Health Authorities of North America.

To Mrs. Seymour and to the members of the family, the Association extends its deepest sympathy.

Editorials

TULARAEMIA

THERE is never a discovery made which has not associated with it an element of romance, whether that discovery be one which catches the popular fancy or one which passes unnoticed except by the initiated few. Tularæmia is a romantic disease—unknown and unrecognized in 1911, discovered first as an epizootic among ground squirrels in Tulare County, California, and less than fifteen years later reported as occurring in man over an area extending from the Atlantic to the Pacific seaboards and from the borders of Canada to Mexico. Its discovery and the elucidation of its epidemiology, pathology and the means of diagnosis are triumphs of the United States Public Health Service, more especially of McCoy and Francis.

The great reservoir of infection is the wild rabbit. For that reason, if for no other, there can be little shadow of doubt that tularæmia exists unrecognized in Canada. The jack rabbit, the cotton tail and the snow-shoe rabbit still do not escape the hunter nor may they be presumed to recognize or obey the immigration laws between Canada and the United States. Known human cases have occurred in every state bordering Canada except Washington, Vermont and Maine. It follows that ordinary curiosity will doubtless find cases in Canada.

The infective microorganism may be introduced by the bite of horse flies and ticks as well as by the dressing or skinning of wild rabbits. It has been shown that Bact. tularense may be transmitted hereditarily to the egg of the tick, though of course no developmental cycle of the microorganism takes place in the tick. The clinical recognition is based upon the tetrad—(1) a history of having dressed a wild rabbit or of being tick or fly bitten; (2) a primary lesion of the skin in the form of a papule followed by a persistent ulcer or primary conjunctivitis; (3) persistent glandular enlargement in the region draining the primary lesions; (4) fever of from two to three weeks' duration.

It is important to appreciate that the laboratory is essential in the establishment of a diagnosis, in that agglutinins for Bact. tularense are demonstrable beginning in the second week, increasing during the third, reaching a maximum about the eighth week and persisting in some degree for a period of many years. In about twenty per cent of cases cross agglutination occurs with Br. abortus and Br. melitensis. Public health diagnostic laboratories should consider the advisability

of carrying out agglutination tests on sera of suspected typhoid cases not only against B. typhosus and Br. abortus but also against Bact. tularense. Since the likelihood of infection of laboratory workers is very great, it is essential that a non-virulent form of Bact. tularense be employed. Fortunately such a strain exists, isolated by Dr. Francis in 1918 and at present available from the laboratory service of the Department of Health, Ontario.

THE MENACE OF MEASLES

EIGHT hundred and ninety-three deaths were recorded as being caused by measles in Canada during 1926! Ninety per cent of these deaths occurred in children under five years of age! And even these figures fail to give adequate measure of the danger of measles to young children, for it is well rocognized that in many cases broncho-pneumonia and tuberculosis follow measles, though no record of such is given in the death reports.

Brownlee in England was the first to point out the importance of concentrating efforts towards the protection of young children from measles. In Syracuse, New York, a successful demonstration was made of the value of such an effort where, by educational publicity, by earlier diagnosis and more careful treatment and by the utilization of convalescent serum in children under 3 years of age, the mortality was reduced considerably below the expected mortality had such measures not been taken.

The factors that are responsible for the rapid spread of measles, the long incubation period, the period of high infectivity when symptoms and signs are absent or of very slight degree, are well known to the medical profession. A contributing factor of great importance is the attitude of parents, based on the erroneous idea that measles is a mild, non-fatal disease and that the sooner all the children have it the better. To inform parents of the real danger which measles is to their young children, and of the importance of having their family physician institute protective measures, is one of the first essentials in any effort to reduce the number of measles deaths. It has been shown that if young children who have been exposed to measles are put to bed before the first symptoms are expected to appear and are kept there for a few days until the incubation period is passed, or, if the infection has occurred, till convalescence is well established, the occurrence of complications with often a fatal outcome is usually prevented. It has been shown, too, that convalescent serum from recently recovered measles patients is of great value in preventing or modifying measles. The essential facts are well known, and if applied to this problem would make possible the saving of many lives each year from this disease. To do this in any municipality calls at once for concerted action on the part of the public, the practising physicians and the organized departments of health.

Definitions of Some Terms Used in Public Health

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Many words are used in technical public health circles without clear-cut and general understanding of what each means. For instance, for the term Health itself, which is in our mouths every day, nine people out of ten, even professionals, can give, if cornered, only a very unsatisfactory definition. Not only do clearly defined technical terms in any science or art aid in clear thinking, and therefore in clear communication of thought, but the great necessity which exists in Public Health technical circles to be clear, not alone within those circles, but also in communicating Public Health ideas to the general public, makes it even more desirable than in other sciences or arts that the terms used should have definite meanings, expressible in very simple words. The following is an attempt to define some fundamental Public Health terms to these ends.

The definitions here offered interlock and are based upon the fundamental facts of Public Health which are in themselves necessarily facts derived from other sciences, Biology, Physiology, Sociology, etc.

These fundamental facts may be outlined thus—the individual living *body* is a unit surrounded by its environment, which latter consists of *the rest of the Universe, i.e.* of everything outside of that individual living body. The environment of any one living body includes, therefore, not only the air, water, earth, sunlight, etc. (*i.e.* the non-living environment), but also immensely numerous other living bodies, (*i.e.* the biological environment). Overlooked from the Public Health standpoint, for generations, the biological environment is now seen to relate even more intimately to health, and especially to disease, than the non-living environment, in ordinary life.

The mere continuation of life, much more the continuation of health, in the individual living body, depends upon the individual ability of that body, first to fit into its environment, and then to make constant changes in its adaptations or adjustments to its environment, as the environment changes. Thus changes in altitude, in temperature, in the mere relative direction of the pull of gravity, require body adjustments; movements of the simplest kind, whether to secure food, to avoid danger or merely to breathe, require an immense number; and every such adjustment must be made individualistically to meet the individualistic demands of the moment.

Health—is that condition of a body which exists when the body is meeting adequately (and without pain or damage) the demands of the moment. (A "healthy" body is one fully equipped to meet easily and well *all ordinary demands.*)

Disease—is that condition of a body which exists when the body is *not* meeting adequately (and without pain or damage) the demands of the moment. (A "diseased" body is one lacking, in kind or degree, one or more adjustments to one or more of the demands it is forced to meet. In most instances of disease, pain and damage are results of attempting adjustment to a demand for which the adjusting mechanism is lacking or inadequate.)

Pain—is a signal to the central nervous system of a mal-adjustment of some part of the body to the demands made upon it.

Damage—is a decrease in efficiency of the body due to such a mal-adjustment to a demand.

COMMENTS—This definition of disease is intended to cover *every* defect or disability of the living body, from congenital malformation to senility; and *every* injury, mechanical, physical, chemical, biological, due to any cause. It is considered as applicable to psychiatry as to medicine, to sociology as to public health; and, metaphorically, to any other sphere of human knowledge. The definition of health being its converse should have equally wide applicability. If any single exception can be produced to either, both definitions, of course, fail.

Hygiene—is all science and art relating to the *adjustments of the body* to the demands of the environment. It is especially concerned with developing the adjusting abilities of the body to a high level and with extending their range. Its great end is the physical education, in its broadest sense, of the body to meet demands; and in this, Hygiene is parallel with, but distinct from, the *object* of education of the mind.

Sanitation—is all science and art relating to the *demands of the environment* upon the body. It is especially concerned with restricting these demands, in degree and in kind, to those levels which the body can meet. Its great end is the use of the environment to conserve and to physically educate the body; and in this Sanitation is parallel with, but distinct from, the *content* of education of the mind.

Promotion of Health—is *applied* hygiene. The chief object to which Hygiene leads is the securing of *good bodies;* and their development (education) to meet the demands of their environment readily and efficiently; *without* pain or damage, and *with* pleasure and profit.

Prevention of Disease—is *applied* sanitation. The chief object to which Sanitation leads is the securing of *good environments;* and their control to the point where their demands do not exceed the ability of the body to meet them easily and well.

Physical Welfare—is an ideal situation, combining both Promotion of Health and Prevention of Disease, so that *health* of the body will exist, under a *continuously* favorable environment. *Health* implies a status of the body which necessarily continues only so long as demands of the environment do not become excessive; physical welfare implies health in a situation where the environment is so under control that excessive demands will never arise.

COMMENTS—The logical basis for distinguishing sharply *Promotion of Health* and *Prevention of Disease* is this—ordinary conditions and ordinary changes in conditions every ordinary body must meet daily, hourly, minute by

minute, or suffer pain, damage (or) (and) death. Hence these ordinary conditions and ordinary changes in them constitute a sort of standard requirement which all bodies must in general meet. To meet them well, easily, with if possible some reserve beyond them, is obviously a minimum requirement for ordinary physical efficiency and enjoyment. To so care for and educate the body that its abilities for adjustment to these ordinary demands may be well assured for all ordinary conditions is surely a worth-while rule of life. Such is the Promotion of Health.

But disease may arise at any moment, even in the presence of such careful and forethoughtful development of the body to meet all ordinary conditions—first by the sudden development *to an extreme degree* of some ordinary demand (extreme heat, extreme cold, etc.); or from the sudden introduction into the environment of an unusual type of demand, one not heretofore encountered (*e.g.* poisons). Thus many a community may go on for many years encountering all the ordinary demands of life very successfully; but smallpox being introduced, these living bodies are required suddenly to adjust themselves to a wholly new demand—the demand of the smallpox poison. Prevention of the damage from such an unusual demand may be achieved by measures, (a) preventing the development of the demand at all, (*i.e.* excluding the disease from the community); or, (b) raising the *potential* ability of the body to meet smallpox into an *actual* ability (*i.e.* by vaccination) in advance of the need for it. Such is the Prevention of Disease.

Thus Promotion of Health relates to enhancing the ordinary abilities of the body—those which all bodies must possess in some degree if they are to meet ordinary conditions at all; while Prevention of Disease relates to, (a) preventing *unusual* demands entirely; or, (b) developing *mere potentialities* for defence into *actual abilities*.

If (a) be accomplished, (b) becomes unnecessary. (*e.g.* inoculation against plague in Canada is uncalled for since the plague organism has so far been successfully excluded from Canada).

Promotion of Health thus becomes a perpetual requirement of all peoples for all time. Prevention of Disease will diminish in importance as the causes of disease are minimized or abolished. (*Note*: The distinction between these two is exceedingly important. The tremendous mistake of much propagandum, very rife a few years ago and still far from silenced, consisted in offering the Promotion of Health as covering also Prevention of Disease, and advocating that attention to the former made the latter unnecessary.)

Public Health—is Hygiene and Sanitation applied to individuals, but *en masse*, and with especial attention to the *inter-relations* of the individuals; it is the inclusive term under which may be placed all the science and art of the present civilization which bears in any way on the achievement of better adjustment between man and his environment.

Public Health Administration—is the science and art of putting into actual operation so much of Public Health as may be carried out governmentally, under existing sociological conditions.

Vital Statistics—(the book-keeping of humanity) is the science and art of accumulating and using the data of *physiological* economics.

Public Health Economics—is vital statistics (the data of *physiological* economics) combined with sociological and financial economics.

Therapeutics—is medical, surgical or nursing science and art applied to the relief of the sick, *i.e.* to correcting *already existing mal-adjustments* between demands and ability to meet them.

Preventive Medicine—is medical, surgical or nursing science and art applied to the development of special adjusting abilities *in advance of threatened mal-adjustments;* hence preventing the occurrence of the mal-adjustment, and so (in the end) doing away with the need for Therapeutics. It is a highly technical branch of Hygiene.

COMMENTS—This definition of Preventive Medicine is intended to represent the present scope of the term. In earlier days Preventive Medicine was used to include the subjects here defined under Hygiene, Sanitation, Preventive Medicine, Epidemiology,—*i.e.* everything relating to Health or Disease not strictly Therapeutic. To-day it is inapplicable in this wide sense. For instance, the construction and care of water supplies, sewage disposal systems, milk supplies, food supplies, cannot now be considered by any stretch of the imagination as "medicine". The medical man of to-day finds these things have grown up beyond his ken. He usually knows little more about them than any other citizen and far less than many of the non-medical experts concerned in them. It would now be as far-fetched to include such subjects under Preventive Medicine as to classify anaesthetics, basal metabolism tests, or the treatment of fractures under mechanical engineering; and it would now be as illogical to attempt to teach the technical sanitary engineering of to-day to medical students as it would be to teach technical anaesthesia, basal metabolism or fractures to mechanical engineering students.

Epidemiology—is medical and sociological science and art, in the widest senses, applied to the prevention of unusual forms of demand upon the body—hence when successful making unnecessary most of both Therapeutics and Preventive Medicine. It is a highly technical branch of Sanitation.

Non-infectious Disease—is a disease not transmissible from one person to another; the term includes all diseases the immediate cause of which are non-living things: hence the term includes poisonings, deficiency diseases; mechanical, physical, chemical diseases; injuries, defects, and disabilities of every kind and degree, not the result of microbes or of their poisons.

Infectious Disease—is a transmissible or communicable disease; so far as present knowledge goes, it is always a disease due to the growth in or on the body, of a bacterium, protozoan, or higher form of life, the transfer of which to new bodies is the final and all-inclusive explanation of the transmissible character of this form of disease. Hence an infectious disease is always a microbic disease; and a microbic disease is always, potentially or actually, an infectious disease.

Infection—is, in *Public Health circles,* a condition of the body or other material substance in which it harbors living pathogenic microbes, capable, potentially or actually, of transfer to other bodies and so of producing a new attack of disease. (In *medical and surgical circles,* infection is usually extended

to include not alone the mere harboring of the microbe but also the production by it of actual recognizable damage *in the harborer.*)

Infected—is an adjective applied to the body or thing in a condition of infection; *i.e.* potentially or actually capable of spreading disease. (The same distinction is made in the use of the term "infected" in Public Health and in Medical and Surgical circles respectively, as is above noted for the term "infection".)

Infective—is an adjective applied only to a body or material *actually* capable of giving infection to other bodies or material.

Quarantine—is the term applied to a situation where legal restrictions are placed upon a person or persons reasonably *suspected* of infectiveness.

Isolation—is the term applied to a situation where legal restrictions are placed upon a person or persons *known* to be infective.

Resistance—is the general ability of a living cell to exclude from itself *saprophytic living cells;* it is dependent upon factors unknown, which, however, disappear on death, and decline as death approaches. It appears to be non-operative against *parasitic living cells,* the distinguishing features of which latter are their ability to invade living tissue, and their inability or disinclination to invade dead tissue.

Immunity—is the condition of a living cell in which it is able to neutralize the poisons of a specific microbe (saprophyte or parasite) or in some cases to destroy that microbe. The term is used of whole living bodies as well as of single cells or aggregations.

LABORATORY SECTION

G. B. REED, Ph.D., AND A. L. MCNABB, V.S.

ERYSIPELAS AND ERYSIPELAS ANTISTREPTOCOCCIC SERUM

THE etiology of erysipelas was studied in considerable detail during the first decade of pathogenic bacteriology but it has required forty years of accumulated information concerning the streptococci to confirm these early studies of the causal rôle of streptococci in the disease and to make possible immunological curative measures. As early as 1883 Fehleisen[1] demonstrated that erysipelatous lesions could be produced experimentally in laboratory animals by the intradermal injection of streptococci isolated from cases of erysipelas. This has been repeatedly confirmed. Over the last twenty years several workers, particularly Tunnicliff,[2] have been demonstrating with increasing evidence by agglutination and by opsonin reactions the differentiation of streptococci isolated from erysipelas from those isolated from other conditions. More detailed information of the last few years concerning the general biology of the hemolytic streptococci makes this conclusion still more evident. The work of Dochez, Avery and Lancefield,[3] of Gordon,[4] of Rivers and Tillett[5] is particularly significant. The extended review by

Thompson and Thompson[6] should also be noted. All this work indicates with considerable precision that streptococci isolated from such infections as erysipelas, scarlet fever, cellulitis and septicemia differ from each other antigenically and possibly fall into individual groups.

The work of the last five years especially has established such a distinction for the organism of scarlet fever, and Birkhaug's recent detailed study of erysipelas appears equally convincing. Birkhaug's[7] work has consisted very largely in confirming earlier evidences of the specificity of streptococci from erysipelas lesions and the development of an antiserum. A detailed study of a large group of cultures of streptococci isolated from erysipelas lesions indicated that over 90 per cent belonged to one group, distinct in agglutination and agglutinin absorption reactions from streptococci isolated from various other infections. This antigenic differentiation was further confirmed by *in vivo* local passive immunity reactions, the procedure just previously developed by Rivers and Tillett. A series of 5 immune monovalent erysipelas sera and one non-erysipelas serum was prepared. Areas of the shaved skin of a series of rabbits were infiltrated by the intradermal injection of 0.1 cc. of immune serum. Twenty-four hours were allowed to elapse for the fixation of the immune bodies in the cutaneous areas, when 0.1 cc. of an emulsion of the streptococci under examination made from a young blood agar slant was injected into the centre of the passively immunized area. This intradermal infiltration with erysipelas sera afforded sufficient passive immunity so that 90 per cent of the cultures of erysipelas streptococci failed to produce lesions, while a similar infiltration with immune scarlatinal serum, which afforded protection against scarlet fever streptococci, afforded no protection against the various cultures of erysipelas organisms. This is in conformity with the results of agglutination. These data together with Birkhaug's[8] detailed study of experimental erysipelas in rabbits, strongly suggest, if they do not demonstrate, the production of a toxin by the erysipelas streptococci and its neutralization by an antitoxin.

Twenty to twenty-five years ago considerable work was done on the preparation of antistreptococcic immune serum, particularly with streptococci isolated from scarlet fever and from erysipelas but, although considerable success appears to have followed the therapeutic use of the serum especially, lack of adequate means of differentiating the streptococci of the several diseases lead many to regard the successful results as coincidence. However, the success of scarlet fever antitoxin, the clear differentiation of the erysipelas streptococci together with the apparent toxin action in skin tests with erysipelas streptococci have recently led to a reinvestigation by several workers. In 1925 Goresco and Popesco using more definitely identified strains of erysipelas streptococci obtained an antiserum which gave very promising results in ameliorating toxic symptoms. The next year Birkhaug[9] followed up his detailed study of the streptococci and of experimental erysipelas in rabbits with an extended consideration of the treatment of erysipelas with antiserum. The procedure consisted first in the immunization of a donkey and later of a horse with definitely established strains of erysipelas streptococci. Dochez's

method of injecting a mass of fluid nutrient agar subcutaneously into which the culture is introduced after the agar solidifies was used in the immunization. With this serum Birkhaug treated sixty typical cases of erysipelas; 100 cc. of unconcentrated serum or 15 to 20 cc. of concentrated serum were administered intramuscularly and the dose repeated if necessary. In all the early cases where serum was administered during the first three days of the disease there was a critical fall in temperature, prompt fading of the erysipelatous lesions and rapid lessening of the toxic depression. In more advanced cases the results while promising were much less definite. In all these cases a skin test dose of toxin was injected intradermally at the same time that the therapeutic dose of serum was injected. It was thus possible to determine the adequacy of the dose of serum.

Since these results of Birkhaug's, two reports covering a considerable number of cases have appeared. In 1927 Symmers and Lewis[10] of Bellevue Hospital, New York, reported on the serum treatment of some 131 cases, and this year Symmers[11] has reported 705 additional cases. The degree of success of the treatment was arrived at by comparison with the previous year when a somewhat similar number of cases was treated without serum. The serum was prepared by intravenous injection of horses with different strains of erysipelas streptococci, and the simultaneous subcutaneous injection of toxin, prepared from similar streptococci and tested for potency by injecting serial dilutions mixed with one skin test dose of erysipelas streptococcus toxin, intradermally into Saanen goats. The results from the two series of cases may be summarized as follows:

Percentage of deaths from all causes in patients treated with serum.....	5.6
Percentage of deaths from all causes in patients *not* treated with serum	11.0
Average number of days in hospital, patients treated with serum.....	4.6 days
Average number of days in hospital, patients *not* treated with serum	11.4 days

These authors are of the opinion that the favourable results in such a large number of cases have established the value of serum. However, they consider that success follows only the early administration, and that protection is only afforded against the immediate attack and not against recurrences or sequelae.

It seems evident therefore that the period of indefinite history of erysipelas and its therapy is approximately at an end.

[1]Fehleisen, Berlin, 1883.

[2]Tunnicliff, R., J. Inf. D., 4, 304, 1907; 5, 268, 1908; J.A.M.A., 75, 1339, 1920.

[3]Dockez, A. R., Avery, O. T. and Lancefield, R. C., J. Exp. Med., 30, 179, 1919.

[4]Gordon, M. H., Brit. Med. Jour., 1921, 632.

[5]Rivers, T. M. and Tillett, W. S., J. Exp. Med., XLI, 185, 1925.

[6]Thompson, D. and Thompson, R., Annals of the Pickett—Thompson Research Laboratory, Vol. III.

[7]Birkhaug, K. E., Proc. Soc. Exp. Biol. and Med., XXII, 292, 1925.

[8]Birkhaug, K. E., Bull. Johns Hopkins Hosp., XXXVII, 85, 1925; XXVII, 307, 1925.

[9]Birkhaug, K. E., Jour. Am. Med. Assoc., 86, 1411, 1926.

[10]Symmers, D. and Lewis, K. M., Jour. Am. Med. Assoc., 89, 880, 1927.

[11]Symmers, D., Jour. Am. Med. Assoc., 91, 535, 1928.

EPIDEMIOLOGY AND VITAL STATISTICS

A. C. Jost, M.D., and Neil E. McKinnon, M.B.

Measles

THERE have appeared recently accounts of several very definite efforts to reduce measles mortality. One of these, by Ruhland and Silverman, appeared in the American Journal of Public Health, February 1928, and one by Gunn in the Lancet of October 6th, 1928.

A working principle for each of these was the recognition of the facts that the majority, 70 per cent, of measles deaths are provided by the age group under 3 years, which group provides less than 15 per cent of the cases, and that mortality from measles is always greater among delicate, under-par children and among those in institutions. The problem narrows down, therefore, to *prevention* of infection in the young age group, in delicate children, and in those in institutions, and if infection or the possibility of infection has occurred in these groups, special care must be exercised to prevent fatal results. Ruhland in Syracuse in 1926-27 used the daily press to impress these facts on the people and to awaken parents to the seriousness of measles in these groups, to the necessity for immediate isolation on the appearance of any symptoms in children and to the importance of calling a physician early. The co-operation of the profession, by their early notification of every case and their use of available convalescent serum, was obtained through frank statements in the weekly bulletin of the department. The nursing service was trained specially and instructive folders were printed for distribution in homes where measles occurred. Dr. Ruhland's summary is as follows:

"It is of course clear that, with the experience of but a single epidemic, conclusions must be limited and drawn with care. Insufficient data for the preceding epidemic make comparison for every point impossible. Nevertheless, the following statements seem warranted:

1. The plan of Brownlee and Godfrey, to concentrate on the age group under 3 years for a reduction in the mortality of measles, seems entirely practical, and has in the management of the 1926-27 epidemic at Syracuse apparently yielded substantial reduction in the mortality of children under 3 years of age.

2. The plan can be most effectively carried out under a generalized nursing system.

3. Useful public interest and co-operation in such a plan can be stimulated and sustained to a remarkable degree by proper publicity.

4. The plan does not require new methods, but merely calls for an intensified application of known procedures."

In the *Lancet* of October 6th, 1928, Dr. Gunn of Park Fever Hospital, under the Metropolitan Asylums Board, recounts his experience with various specific sera, (so-called); measles antitoxin prepared by the Wellcome Physiological Research Laboratories from a horse inoculated with culture filtrate of Tunnicliff's g r e e n - producing streptococcus, measles antitoxin produced from a

horse inoculated with culture filtrate of the streptococcus morbilli of Ferry and Fisher, and measles anti-serum obtained from Degwitz were used as well as convalescent serum. The various children's wards were an ideal place to test the prophylactic value of these sera. In spite of the fact that the number is not large, the difference in the results obtained by convalescent serum in contrast to any other serum is significant and is altogether in favour of the use of convalescent serum. The description of the cases which were not wholly protected but in which modified measles occurred adds strongly to the evidence presented in the table.

THE RESULTS OF PROPHYLACTIC ADMINISTRATION OF FOUR SERA IN MEASLES CONTACTS.

Serum injected	No. of susceptibles injected	Percentage		
		Developing measles	Apparently protected	Serum reactions
Tunnicliff's	21	57.1	42.9	14.28
Ferry & Fisher's	12	100	0	33.3
Degwitz's	10	60	40	10
Convalescent serum	69	4.3	95.7	0

REPORTED CASES OF CERTAIN COMMUNICABLE DISEASES IN CANADA BY PROVINCES—DECEMBER, 1928

Disease	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Diphtheria	50	21	265	409	96	52	67	96
Scarlet Fever	69	64	380	544	89	123	294	53
Measles	1	1	118	2,565	179	46	65	26
Whooping Cough	91	8	55	460	52	12	21	11
German Measles	3	—	*	27	*	12	6	—
Mumps	3	—	*	507	124	86	93	140
Smallpox	9	—	52	16	26	60	30	75
Cerebrospinal Meningitis	—	1	2	4	—	1	4	1
Anterior Poliomyelitis	—	1	3	4	4	—	4	—
Typhoid Fever	16	8	21	91	5	4	3	—

*Not reportable.

EIGHTEENTH ANNUAL MEETING
CANADIAN PUBLIC HEALTH ASSOCIATION
MONTREAL, P.Q., JUNE 18th, 19th, 20th, 1929

PUBLIC HEALTH NURSING

RUBY M. SIMPSON, REG.N., AND FLORENCE H. M. EMORY, REG.N.

AN EFFORT FOR THE PRE-SCHOOL CHILD

DOROTHY M. HOPKINS, Reg.N.

MEDICAL examination of children of pre-school age has been an accepted phase of public health effort in Saskatchewan for several years. Conducted by a specially trained doctor and nurse from the Provincial Health Department, clinics or conferences for such examination have been held in many parts of the province and have been sponsored most enthusiastically by local and provincial women's organizations, from whom, indeed, the request for the service has usually come and by whom the local arrangements have been made. With the recent change from specialized to generalized public health work and the consequent increase in the number of nurses available, the policy of organization of pre-school conferences has been continued and considerable interest is attached to the results which have been obtained during the recent summer months under the new plan.

In her district of approximately six municipalities each nurse organized and arranged her own pre-school conferences with the assistance of such women's organizations as she found available, the local medical men and the municipal council. Arrangements for medical examiners were made to suit the particular situation in each case, with the expressed aim of having as many as possible undertaken by the local doctor. Ninety-two conferences were held during the months of June, July, August, September and October, the majority being one full day but several extending through the second day. Forty-six of these were conducted by the local doctor who gave his services without charge, forty-two by a doctor sent from the Department of Health and four by the local doctor assisted by the Department doctor. One nurse succeeded in organizing fourteen conferences in her district, in all of which the local medical men gave their services. In another district, comprised mainly of Mennonite villages, the nine conferences arranged were attended by the local doctor. In one town in the northern part of the province the five medical men all assisted in the examinations, each for a certain period, two being in attendance at all times during the day. In centres where the doctor from the Health Department was in charge the local men were all present at some time during the day and expressed interest in and appreciation of the work done. This co-operation and assistance from the medical profession is the outstanding feature of the season's work and suggests the possibility of rather remarkable success in future years.

In these ninety-two conferences 3,515 children, or an average of 38 per conference, ranging in age from infancy to seven years were given a complete and thorough medical examination and parents were advised as to treatment in cases of remediable

defect. Keen interest on the part of parents was evinced, many of them bringing their young families from long distances to take advantage of the service, and fathers as well as mothers taking the trouble to be present at the examination. Child health literature was available in a conspicuous place in the conference room in every case and the busy nurse crowded in time to discuss individual cases and to find the pamphlet or bulletin to suit the need. The dissemination of information related to child health by this means is not the least of the functions of a pre-school conference.

Follow-up work in each district will be a part of the nurse's work in the homes and a record will be kept of the cases reported until the advised correction is secured. Efforts are also being made to follow each conference with a day devoted to immunization since large numbers of children of this age are found who have not been protected against diphtheria, scarlet fever or smallpox. Such work for pre-school children is not recounted as being outstanding in any way, but it will always be of interest as the result of the first efforts under the changed system.

THE SESSIONS OF THE PUBLIC HEALTH SECTION OF THE CANADIAN NURSES' ASSOCIATION, WINNIPEG, JULY 1928

When the sessions of the Canadian Nurses' Association were opened in Winnipeg on July 3rd, 1928, nurses from every province of the Dominion were present to consider questions affecting the extension and application of health service to all. It is difficult to say where the greatest emphasis was placed. Nursing Education, Private Duty and Public Health sections were subjected to detailed scrutiny, that we might become familiar with newest developments. They all proved to be roads which lead to the Mecca of capacity for service.

Miss Elizabeth Smellie, Chief Superintendent of the Victorian Order of Nurses for Canada, as Chairman of the Public Health Section, in her able report made it evident that present efforts must not only be maintained but greatly extended if substantial progress is to be made. In the afternoon the subject presented in five excellent papers was that of *The Nurse as a Teacher of Infant Care*. Miss Ruby M. Simpson, Assistant Director of Public Health Nursing, Regina, discussed the subject from a psychological standpoint under the caption, *Fundamental Principles of Teaching*. Miss C. V. Barrett, Superintendent of the Royal Victoria Maternity Hospital, Montreal, in an interesting paper presented the topic as applied to training schools, while Miss C. deN. Fraser, Winnipeg, discussed the subject from the outlook of a private duty nurse. Miss Marjorie Baird, Edmonton, spoke on *The Mother and the Big Sister in the Home*, stressing the importance of careful preparation by the nurse in order to meet the multiform opportunities presented. Miss J. G. Stothart, Winnipeg, in her paper, *The Big Sister at School*, outlined briefly the work taught to girls and boys in grade eight, and the excellent results obtained. Each speaker led one to infer that it is an honour and a privilege to be a nurse, but that privileges always imply corresponding duties, hence the need for constant vigilance and effort on the part of the nurse. Because of the vision and endeavour of the nurse as

a teacher of infant care a national health consciousness will have been quickened. At the close of the afternoon session five girls from a grade eight class gave a home nursing demonstration, which afforded pleasure to all present. This demonstration proved that a Little Mothers League is a very effective way of disseminating health information.

On Thursday evening at the public meeting, Dr. A. T. Mathers, Provincial Psychiatrist for Manitoba, presented the topic, *Mental Hygiene and Nursing*. Concentrated action on the part of every nurse is required to educate the general public and influence the proper authorities for the promotion and preservation of the mental health of the community. Miss Ruth Hallowes, Educational Director of the College of Nursing, London, England, in a scholarly manner spoke on *Tradition in English Nursing*. Looking into history as far back as the eleventh century Miss Hallowes traced the progress and development of hospitals through the succeeding centuries. In this interesting résumé of the transcending vicissitudes of hospitals, it was shown that tradition had been a very important factor in their growth and development.

At the concluding evening session on Friday, Miss Finch, Secretary of the United Farm Women of Manitoba, read a splendid paper on *Public Support of Nursing Services*. Miss Charlotte Whitton, Executive Secretary, Canadian Council on Child Welfare, held the audience with a forceful address on *The Public Health Nurse and the Child Welfare Programme*. Honorable E. W. Montgomery, Minister of Health and Public Welfare, Manitoba, in the final speech of the evening, *What a Department of Public Health Expects of the Nursing Profession*, advocated close co-operation between the medical officer of health and the public health nurse.

NATIONAL VOLUNTARY HEALTH AGENCIES

RUBY M. HAMILTON, Reg.N.

EXHIBIT OF THE VICTORIAN ORDER OF NURSES

The Victorian Order of Nurses for Canada has recently had constructed a permanent loan exhibit shown for the first time at the meetings of the Canadian Public Health Association in Winnipeg in October.

The exhibit, which occupies a space approximately 8 by 6 feet is enclosed in a wooden framework, fronted by pillars and cross-piece, and painted attractively in buff, blue and gold. Heavy velour velvet hangings, shading from dark blue at the sides to silvery blue at the centre form the sides and background.

In the centre back, commanding immediate attention, is a "box-like" arrangement in three dimensions, representing a scene familiar to Victorian Order nurses, and typifying the fundamental work undertaken by the Order—namely bedside nursing.

In this room by means of coloured

cardboard cut-outs, the mother is shown watching interestedly from the bed while the nurse bathes the baby. A ten-year old girl is carrying mid-morning nourishment to her mother. "Sunlight" streams through the window at the rear. After the above picture was taken the scene was improved in various ways. Curtains were added to the window, flowers placed on the chiffonier, and a rug and sewing basket placed on the floor.

Surmounting the room scene is the Victorian Order crest in blue and gold. Immediately below the "box" is an illuminated "travel word sign" bearing the following message,

"In addition to actual bedside nursing care the Victorian Order nurse engages in various forms of public health nursing work according to the health needs of the community served." On either side of the floor space are blue beaver-board panels, framed and inscribed in gold, and bearing these captions, "The only national voluntary health organization caring for the sick in their own homes on a visit basis" and

"Bedside nursing with teaching in the home is the fundamental principle of Victorian Order work."

It is hoped that the Victorian Order exhibit, giving, as it does, a clear picture of the Order's aims and activities, may thus contribute to the education of the public in the work of organizations interested in the subject of community health.

NEWS AND COMMENTS

P. A. T. SNEATH, M.D., D.P.H.

Nova Scotia

DR. GEORGE A. MacINTOSH has been appointed to succeed Dr. A. C. Jost, who was recently retired from the position of Provincial Health Officer.

Dr. S. R. Johnston, in the presidential address of the Halifax Branch of the Medical Society of Nova Scotia dealt with the relation of the profession to public health. He considered that cancer should now be recognized as a public health problem which should be combated by earlier diagnosis and suitable treatment.

The Canadian Government patrol ship, used as a hospital ship by the fishermen of the Grand Banks, has completed another season. More than three hundred persons were treated, many minor operations performed and some patients, more seriously ill, transported to shore.

New Brunswick

VARIOUS organisations interested in the Health Centre in the City of Saint John, recently presented to the Centre a portrait of the Honourable Dr. W. F. Roberts. Dr. Roberts was largely instrumental in the foundation of the Health Centre, was always interested in welfare work, and was New Brunswick's first Minister of Health.

A survey of the hospitals in Saint John was made in November by Dr. Walsh of the American College of Surgeons.

Quebec

THE International Congress of Nurses will be held in Montreal this year from July 8-13th. There are expected about 3000 delegates representing over forty countries. The sessions will be conducted in three languages, English, French, and German, translations of each being made for the convenience of the delegates. The Grand Council is expected to have its executive meetings prior to the commencement of the Congress. Miss H. P. Hersey, Superintendent of Nurses in the Royal Victoria Hospital, is the general convenor.

Dr. W. F. Walker of the American Public Health Association, who was engaged in the health survey in Montreal, recently gave two public addresses in Montreal in which he emphasized the findings and recommendations of the Report of the Committee. He pointed out that more infants in Montreal died of diarrhoea and enteritis than in New York City; that in 1927, Montreal had had 219 deaths from diphtheria—"a thoroughly preventable disease"; and that the per capita cost of 39 cents for public health services in Montreal was too low for adequate service.

The Industrial Clinic operated by McGill University in the Montreal General Hospital, celebrated its first anniversary in October. It had a most satisfactory year, having had more than 1,600 people attending for examination or treatment or both. Besides this it stimulated and arranged for health service in many industrial plants. It will shortly inaugurate a dental clinic. Dr. Frank G. Pedley, the Director, has reason to be proud of the record of the clinic which already is filling a great need in the industrial life of the city.

Ontario

AT recent meetings of the Academy of Medicine, Toronto, two questions of great public health interest have been discussed; first, the *Pulmonary Tuberculosis of Childhood and Adolescence* and second, *Undulant Fever in Ontario*. In an able paper on Pulmonary Tuberculosis, Dr. F. Maurice McPhedran, of the Henry Phipps Institute, Philadelphia, emphasized the necessity for adequate X-ray work in the diagnosis of tuberculosis in childhood and pointed out the vital importance of contact in the young age groups. Dr. Warner of Welland presented a paper outlining the clinical aspects of undulant fever, while Drs. McKay and McNabb of the Department of Health, Ontario, discussed it from the epidemiological and laboratory viewpoints. About twenty cases have been brought to light in Ontario since July 1, 1928.

The Ontario Medical Association has approved of the principle of the establishment of a scholarship for the furtherance of medical research in conjunction with the Ontario Research Foundation. No definite subject of research was determined nor was any fixed amount settled for this purpose, but it is presumed that the Government will duplicate any sum subscribed as in industrial research.

We have to note with much regret the death of Dr. Wm. B. Sharpe, M.O.H. for Brampton; of Dr. A. R. B. Williamson, M.O.H. for Kingston; and of Mr. Herbert Cusack, Chief Sanitary Inspector of the Department of Public Health, Toronto.

Dr. Charles H. Best, Assistant Professor of Physiological Hygiene in the School of Hygiene, University of Toronto, has been appointed Professor of Physiology in the Faculty of Medicine and will continue to direct the Department of Physiological Hygiene in the School of Hygiene.

The University of Toronto and Canada in general have suffered a distinct loss in the sudden death of Professor C. L. Starr. Dr. Starr in 1921 was appointed the first full-time professor of surgery in the Faculty of Medicine, and chief surgeon to the Toronto General Hospital. His sudden death at the age of sixty on Christmas Day came as a distinct shock to all.

Three thousand dollars has been granted by the Women's Institutes of this province towards the maintenance of a physician in one of the sparsely settled sections. Dr. O. W. Anderson has opened practice at Tobermory in the Bruce Peninsula as a demonstration of the practicability of such a scheme.

Manitoba

AN epidemic of smallpox of the mild type occurred recently in the districts of St. Agathe, Morris and St. Vital but was quickly checked by the general vaccination and revaccination of the people.

The report of the Health and Hospital Survey has been presented to the Minister and it is expected that the findings of the report will receive consideration at the next session of the legislature. The survey covered the entire province and included a complete survey of tuberculosis as to number of cases and facilities for treatment, etc. The report included also a complete survey of hospitals and

nurses' training schools. A personal visit was made to every rural health officer and valuable information was obtained and compiled in this report on the general health conditions in the province.

Alberta

A MEETING of the Advisory Committee of the Health Department was held recently at which were represented the Department, physicians, nurses, health officers, hospital boards, and the College of Physicians and Surgeons. The question of travelling tonsil clinics caused considerable discussion. It was intimated that the Government was agreeable to transferring the work to the Council of the College of Physicians and Surgeons, if that body would be responsible for the character of the work done and the cost be no greater than at present. School medical inspection, indigent patients, hospital accommodation, and nursing service in outlying districts were among the subjects considered. The Advisory Committee expressed itself as favouring the establishment of certain "health units" as soon as possible.

British Columbia

DR. R. E. COLEMAN, Assistant Director of Laboratories at the Vancouver General Hospital is resigning this appointment to engage in practice.

Following upon the establishment of the municipality of Greater Vancouver under the civic organization comes the co-ordination of the health activities of the three formerly separate municipalities. The management committee of the School Board have approved of the following appointments to their medical staff: Dr. Harold White, chief medical officer; Dr. George A. Lamont, associate medical officer; Dr. Watson Dykes, assistant medical officer; and Miss E. G. Breeze, head nurse.

A UNIQUE service was initiated in Australia by the Presbyterian Church of Australia some three years ago to provide emergency medical attention for the settlers in the "back-lots". In a letter to the *British Medical Journal*, Dr. J. W. Dunbar Hooper of Melbourne describes this Australian Inland Flying Mission, which was actually put into action in February 1928. A De Havilland "50" machine, accommodating a pilot, doctor, nurse, patient and stretcher is kept ready at Cloncurry, Queensland, which place is in wireless and telegraphic communication with the districts to be served. On receipt of a call the doctor and nurse are despatched to the afflicted person for the purpose of affording such treatment as is immediately necessary, and the patient is transported by air to the nearest hospital where the regular treatment is afforded by the local practitioner with such assistance from the flying medical officer as may be requested.

The first flying medical officer of this Mission is Dr. K. St. Vincent Welch, who has a salaried appointment without private practice. The practitioners of this area are often 150 miles apart and this service it will be seen in no way encroaches upon their practice, but is rather of additional assistance to them as well as affording the patient all the facilities of hospital treatment. The average flying radius of calls is said to be about 400 miles.

BOOK REVIEWS

D. T. FRASER, B.A., M.B., D.P.H. and R. R. MCCLENAHAN, B.A., M.B., D.P.H.

International Clinics — *Volume II, Thirty-eighth series,* 1928. *J. B. Lippincott and Co.,* 201 *Unity Building, Montreal.*

In this volume three articles are thought to be of particular interest to readers of the Canadian Public Health Journal and are briefly reviewed in the following paragraphs.

1. "Venereal Disease and Marriage Consent" by Leo Von Zumbusch, Munich, Bavaria. The opening sentence, "The question as to whether a patient infected with venereal disease should be permitted to marry has always been hard to answer", prepares the reader for the thorough and rigid examinations proposed.

2. "Diagnosis of Pulmonary Tuberculosis from the Viewpoint of the General Practitioner" by H. R. M. Landis, The Henry Phipps Institute. The importance of certain symptoms is discussed. The article stresses the need of remembering (1) a careful history; (2) the clinical thermometer; (3) the use of scales; (4) the examination of sputum. The man in general work does not have "classified" patients coming to him. Such an article helps him to keep on the *qui vive* for tuberculosis.

3. "Hygiene, Preventive Medicine and Public Health since 1891" by Hugh S. Cumming, M.D., D.Sc. The progress made in these years is told in a brief and interesting fashion. The knowledge of the manner and means of spread of disease laid a necessary foundation for such progress. The control of certain diseases is given in more or less detail. This leads on to the improvements in sanitation, in food handling, and in the health of the school child and the industrial worker. The collection of statistical records has been developed. Health education is receiving attention and mental hygiene is hoped to afford prevention of mental illness. The responsibility for the standardization of serological products has been assumed. The average expectancy of life is greater. In concluding the article recalls that great as the progress has been, the field contains many problems still unsolved.

A. M. JEFFREY

Tracking down the Enemies of Man —*Arthur Torrance, M.D., Ph.D.,— J. H. Sears and Co., New York.* Price $3.50.

The author appeals to two audiences —those who enjoy a thrilling story of adventure in Africa, India and Borneo, and also to those who, without going too deeply into the subject, desire a general picture of the problems of tropical medicine. One gathers that the author knows the tropics, and is equally familiar with the medicine-man of the savage and the remedies such as quinine, tryparsamide and Bayer 205 which have brought under control the worst of tropical diseases. The medical information given, while somewhat sketchy, appears to be accurate, and while the book is intended for the public, it should provide an entertaining evening for the physician who is interested in preventive medicine.

An appreciation by Trader Horn is added, evidently with an eye to the book-stall trade. H.C.C.

CURRENT HEALTH LITERATURE

D. T. FRASER, B.A., M.B., D.P.H,

Serum Prophylaxis in a Measles Epidemic—The beneficial effect of convalescent serum in the prevention or modification of measles has long been satisfactorily established. It is none the less gratifying that this relatively simple procedure can be applied in a large city at a low cost and with good results. It would seem to indicate that there is little or no excuse for any organized community not to offer convalescent measles serum for prophylaxis.

Silverman reviews the contributions to the knowledge of measles, details the procedures carried out during an epidemic in Syracuse, and comments on the results obtained. The cost per dose, exclusive of administrative expense, was one dollar. A special effort was made to use the serum in the case of children of three years of age and under exposed to infection. It is in this group that deaths are most likely to occur. In the discussion of the paper read at the American Medical Association, Minneapolis, Park mentions that the use of Tunnicliff-Ferry antiserum and the sheep serum of Degkwitz has not proved to be of any value. This bears out Silverman's experience. Further, the value of using the serum of parents who have had the disease when no other serum was available was emphasized.

A. CLEMENT SILVERMAN. J.A.M.A., Vol. 91, Dec. 8th, 1928, p. 1786.

Bacteriological and Clinical Study of One Hundred Cases of Scarlet Fever—This study presents certain data which suggest the possible correlation between clinical features of scarlet fever and the *type* of haemolytic streptococcus found upon bacteriological and serological examination. Four types are described, namely I., II., III. and IV. and a heterogeneous group. This latter group, which formed the largest of the series, comprised individualistic strains, none of which occurred with sufficient frequency to form a fifth type. It is somewhat disconcerting to note that in only fifty per cent of the cases the type remained the same throughout the attack. The change of type noted in the other fifty per cent was considered to be a reinfection. In three patients, in whom the Dick reaction remained positive the appearance of the new type coincided with a second attack of clinical scarlet fever. On discharge from hospital of the total of one hundred cases, forty-nine were "throat carriers" and six "nose carriers". None of the fifty-five, so far as was ascertained, gave rise to return cases. There is evidence deduced in favour of qualitative as opposed to quantitative differences in toxin production by different types.

GUNN and GRIFFITH, Jour. of Hygiene, Vol. 28, No. 3, p. 250, Dec. 1928.

Smallpox Vaccination — An interesting review of the historical development of vaccination is briefly set out. The modern preparation of vaccine, technique and after care are dealt with in detail. Vaccine reactions and their interpretation are fully discussed and excellently illustrated. The article should have wide publicity and will serve to dispel many misconceptions.

R. D. DEFRIES and N. E. McKINNON. Canad. Med. Assoc. Jour., Nov. 1928, p. 525.